MELSEC System Q

Programmable Logic Controllers

User's Manual

DeviceNet Master-Slave Module
QJ71DN91
GX Configurator-DN

Art. no.: 139835
01 05 2003
SSH (NA)-080143
Version F

MITSUBISHI ELECTRIC INDUSTRIAL AUTOMATION

• SAFETY PRECAUTIONS •

(Always read these instructions before using this equipment.)

Before using this product, please read this manual and the relevant manuals introduced in this manual carefully and pay full attention to safety to handle the product correctly.
The instructions given in this manual are concerned with this product. For the safety instructions of the programmable controller system, please read the User's Manual of the CPU module to use.
In this manual, the safety instructions are ranked as "DANGER" and "CAUTION".

⚠ DANGER	Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.
⚠ CAUTION	Indicates that incorrect handling may cause hazardous conditions, resulting in medium or slight personal injury or physical damage.

Note that the ⚠CAUTION level may lead to a serious consequence according to the circumstances. Always follow the instructions of both levels because they are important to personal safety.

Please save this manual to make it accessible when required and always forward it to the end user.

[DESIGN PRECAUTIONS]

⚠ DANGER

- If a communications error occurs to a device network, the node in such a communications error will be in a state as follows:
  (1) The master node (QJ71DN91) maintains input data which had been received from the slave node before the error occurred.
  (2) Whether the slave node's output signal is turned off or maintained is determined by the slave node's specifications or the parameters set at the master node. When using QJ71DN91 as a slave node, the entered data from master node before the faulty node is maintained.

  By referring to communications states of the slave node, arrange an interlock circuit in a sequential program and provide safety mechanism externally of the slave node in order the system to operate safely.

⚠ CAUTION

- Do not bunch the control wires or communication cables with the main circuit or power wires, or install them close to each other.
  They should be installed 300 mm (11.8 inch) or more from each other. Not doing so could result in noise that may cause malfunction.

[INSTALLATION PRECAUTIONS]

⚠ CAUTION

- Use the PLC in an environment that meets the general specifications contained in the CPU User's Manual to use.
  Using this PLC in an environment outside the range of the general specifications may cause electric shock, fire, malfunction, and damage to or deterioration of the product.
- When installing the module, securely insert the module fixing tabs into the mounting holes of the base module while pressing the installation lever located at the bottom of the module downward.
  Improper installation may result in malfunction, breakdown or dropping out of the module.
  Securely fix the module with screws if it is subject to vibration during use.
- Tighten the screws within the range of specified torque.
  If the screws are loose, it may cause fallout, short circuits, or malfunction.
  If the screws are tightened too much, it may cause damage to the screw and /or the module, resulting in fallout, short circuits or malfunction.
- Switch all phases of the external power supply off when mounting or removing the module.
  Not doing so may cause electric shock or damage to the module.
- Do not directly touch the conductive area or electric components of the module.
  Doing so may cause malfunction or failure in the module.

[WIRING PRECAUTIONS]

⚠ DANGER

- Make sure to shut off all the phases of the external power supply before starting installation or wiring. Otherwise, the personnel may be subjected to an electric shock or the product to a damage.

⚠ CAUTION

- Be careful not to let foreign matters such as sawdust or wire chips get inside the module.
  These may cause fires, failure or malfunction.
- The top surface of the module is covered with protective film to prevent foreign objects such as cable offcuts from entering the module when wiring.
  Do not remove this film until the wiring is complete.
  Before operating the system, be sure to remove the film to provide adequate heat ventilation.
- Be sure to fix cables leading from the module by placing them in the duct or clamping them.
  Unless the cables are placed with a duct or clamped, the module or cables could be broken by swinging or moving of the cables or unintentional pulling to cause an operation error resulting from a contact error.
- Do not pull cables by holding them with a hand for removing the cables that are connected to the module. To remove a cable having a connector, hold the connector connected to the module with a hand. To remove a cable not having a connector, loosen the screws fastening to connect the module. The cables being pulled while they are still connected to the module could break the module or cables, or cause an operation error resulting from a contact error.

[CAUTIONS ON STARTUP AND MAINTENANCE]

⚠ DANGER
• Always turn off all external power supply phases before touching any terminals. Failure to do this may result in malfunction. • Always turn of all external power supply phases before cleaning or tightening the terminal screws. Failure to do this may result in malfunction. • Do not disassemble or modify any module. This will cause failure, malfunction, injuries, or fire. • Always turn off all external power supply phases before mounting or dismounting the module. Failure to do this may result in malfunction or damage to the module. • Always make sure to touch the grounded metal to discharge the electricity charged in the body, etc., before touching the module. Failure to do so may cause a failure or malfunctions of the module.

[DISPOSAL PRECATION]

⚠ CAUTION
• Dispose of this product as industrial waste.

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REVISIONS

* The manual number is given on the bottom left of the back cover.

Print Date	* Manual Number	Revision
Dec., 2000	SH (NA)-080143-A	First Printing
Jun., 2001	SH (NA)-080143-B	Addition Section 2.3, 2.4 Delete Section 2.2.1, 2.2.2 Correction SAFETY PRECAUTIONS, About the Generic Terms and Abbreviations, Product Configuration, Section 2.2, 2.4, Section 6.2, 6.2.1, 6.2.2, 6.3.3, 6.5
Feb., 2002	SH (NA)-080143-C	Correction About the Generic Terms and Abbreviations, Section 2.2, Section 6.2.1, 6.2.2
Dec., 2002	SH (NA)-080143-D	Addition Section 2.5 Correction Section 2.2, Section 3.3.2, 3.4.1, Section 6.1, 6.2.1, 6.3.2, 6.4, 6.5, Section 9.2.1, 9.2.2
Feb., 2003	SH (NA)-080143-E	Correction SAFETY PRECAUTIONS, INTRODUCTION, CONTENTS, Section 6.2.2, Section 6.3.3, Section 6.4, Section 6.5
May., 2003	SH (NA)-080143-F	Correction Section 6.3.1

Japanese Manual Version SH-080125-F

INTRODUCTION

Thank you for purchasing the MELSEC-Q series PLC.
Before using the equipment. please read this manual carefully to develop full familiarity with the functions and performance of the Q series PLC you have purchased, so as to ensure correct use.

CONTENTS

Conformation to the EMC Directive and Low Voltage Instruction

For details on making Mitsubishi PLC conform to the EMC directive and low voltage instruction when installing it in your product, please see Chapter 3, "EMC Directive and Low Voltage Instruction" of the User's Manual (Hardware) of the PLC CPU to use.

The CE logo is printed on the rating plate on the main body of the PLC that conforms to the EMC directive and low voltage instruction.

BY making this product conform to the EMC directive and low voltage instruction, it is not necessary to make those steps individually.

About the Generic Terms and Abbreviations

Unless otherwise specified, this manual uses the following generic terms and abbreviations to explain QJ71DN91 DeviceNet Master·Slave Module.

Generic Term/Abbreviation	Description
GX Developer	Generic product name of the product types SWnD5C-GPPW-E, SWnD5C-GPPW-EA, SWnD5C-GPPW-EV and SWnD5C-GPPW-EVA. "n" in the model is 4 or greater.
QCPU (Q mode)	Generic term for Q00JCPU, Q00CPU, Q01CPU, Q02CPU, Q02HCPU, Q06HCPU, Q12HCPU, Q25HCPU, Q12PHCPU, Q25PHCPU
GX Configurator-DN	Abbreviation for DeviceNet Master-Slave Module setting/Monitor Tool GX Configurator-DN (SW1D5C-QDNU-E)
QJ71DN91	Abbreviation for QJ71DN91 DeviceNet Master-Slave Module
Personal computer	IBM PC/AT® or compatible computer with DOS/V.

Product Configuration

The following is a list of the components in this product configuration.

Model name	Product name	Quantity
QJ71DN91	QJ71DN91 DeviceNet master-slave module	1
	Terminal resistor 121Ω, 1/4W	2
	Connector	1
SW1D5C-QDNU-E	GX Configurator-DN Version 1 (1-license product) (CD-ROM)	1
SW1D5C-QDNU-EA	GX Configurator-DN Version 1 (Multiple-license product) (CD-ROM)	1

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1 OVERVIEW

1

This manual explains the specifications and name of each component of the QJ71DN91 DeviceNet master/slave module, which is used in combination with the MELSEC-Q Series PLC CPU.
Please see DeviceNet Specification Manual (Release 2.0), Volumes 1 and 2, for the specifications of DeviceNet.
DeviceNet is a registered trademark of Open DeviceNet Vendor Association, Inc.

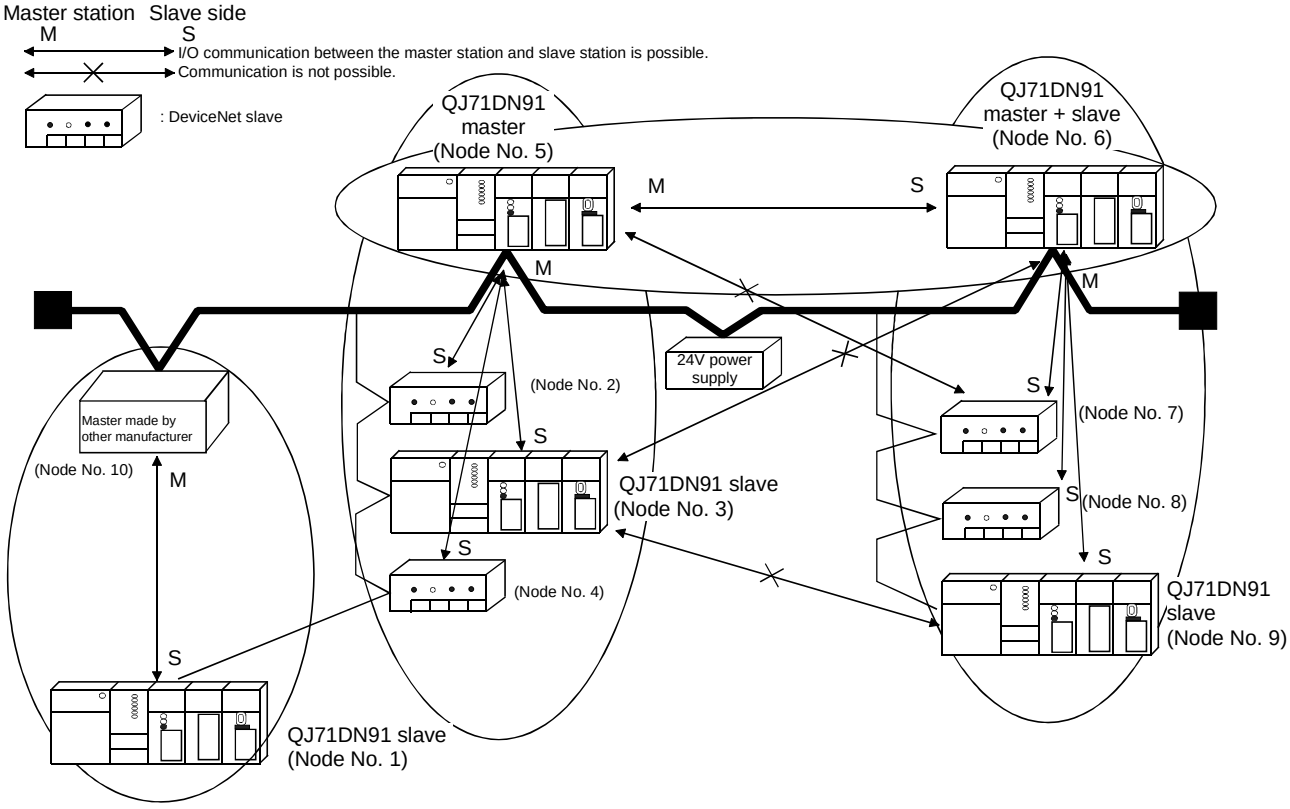
POINT
Most of the DeviceNet products on the market are assumed to be compatible. However, compatibility with the products of other manufacturers is not guaranteed.

1.1 Features

This section explains the features of the QJ71DN91.

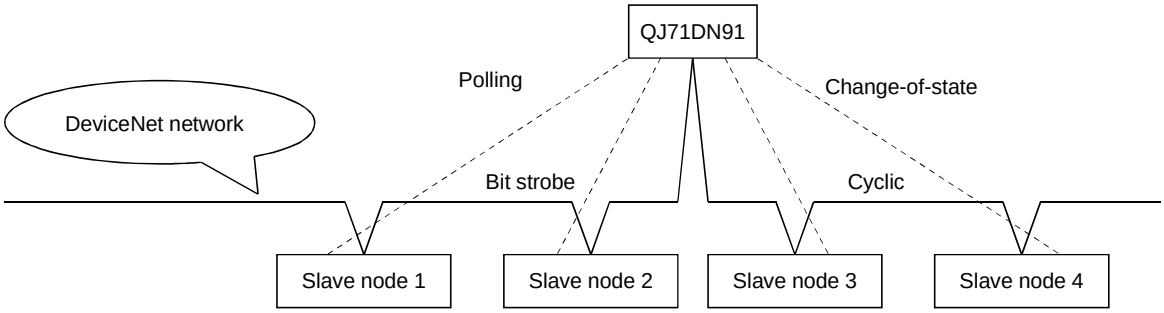
(1) The module conforms to the DeviceNet Specifications Manual (Release 2.0).

(2) The module can function as a master node, slave node, or master/slave node of DeviceNet.



(3) The parameters of QJ71DN91 can be set by any of the following three methods:
- Setting the parameters using GX Configurator-DN
- Setting the parameters using the TO instruction of a sequence program
- Setting the parameters using auto configuration

(4) When the module functions as a master node of DeviceNet, I/O communication and message communication with a DeviceNet slave node are possible.
(5) When the module functions as a master node of DeviceNet, the module can communicate with a maximum of 63 slave nodes.
(6) Selection is available from four types of I/O communication methods when this module functions as a master node in DeviceNet. They are polling, bit strobe, change-of-state and cyclic which are defined in DeviceNet.
However, only one type of communication method can be selected for each slave node.



For I/O communication, see Section 3.2.1.

(7) When the module functions as a master node of DeviceNet, an I/O communication with input of 256 words (4,096 points) and output of 256 words (4,096 points) can be performed.
(8) When the module functions as a master node of DeviceNet, a message communication of 240 byte data can be performed at one time.
(9) When the module functions as a slave node of DeviceNet, I/O communication with input of 64 words (1,024 points) and output of 64 words (1,024 points) can be performed.
(10) When the module functions as a slave node of DeviceNet, I/O communication can be performed via polling.

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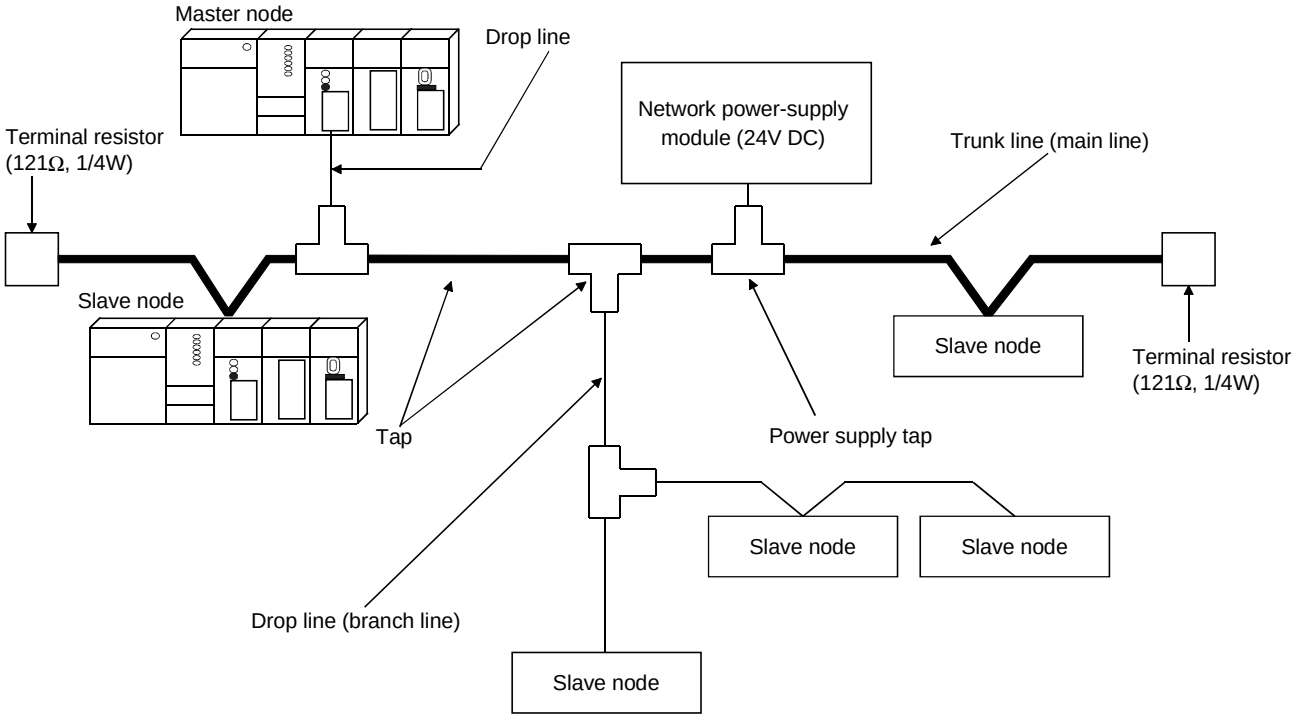
2 SYSTEM CONFIGURATION

This chapter explains the system configuration of DeviceNet.

2.1 Overall Configuration

A total of 64 modules including a master node, slave nodes and a master/slave node can be connected.
Each node is connected via a tap from the trunk line or directly to the trunk line.
The following shows an example of a system configuration:



1) The QJ71DN91 can be used as a master node, a slave node or a master/slave node.
2) A combined maximum of 64 master node and slave nodes can be connected.
3) There is no need to connect the master node and slave nodes in the order of node number.
4) The network cable consists of trunk line (main line) and drop lines (branch lines).
   Terminal resistors are required on both sides of the trunk line.
5) It is necessary to connect the network power supply in order to supply the power supply to the communication circuit in addition to the operating power supply of each node.
6) Use the terminal resistors included in the package, or they must be furnished by the user.

(1) Network specification

The following explains the network specifications of DeviceNet that uses the QJ71DN91.

(a) Communication speed

The communication speed can be selected from 125kbaud, 250kbaud, or 500kbaud using the mode switch of the QJ71DN91.

The maximum cable length varies depending on the communication speed. See Section 3.1, "Performance Specifications" for details.

(b) Supplying power to the network

The following describes the method of supplying network power to each node:

1) Connect a dedicated power supply tap to the trunk-line cable and install the network power-supply module.
2) The power is supplied from the network power-supply module to each node via the network cable.

Remarks

Inquire to ODVA about the following devices required to construct a DeviceNet network.

- Network power-supply module
- Power supply tap
- Tap
- Terminal resistor
- Network cable

Contact at ODVA is as follows:
Open DeviceNet Vendor Association, Inc.
Address
20423 State Road 7 - Suite 499 - Boca Raton, FL 33498 U.S.A.
TEL. +1-954-340-5412
FAX. +1-954-340-5413 or +1-561-477-6621

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2.2 Applicable Systems

This section describes the system configuration for the QJ71DN91.

(1) Applicable module and the number of modules that can be installed

The following are the CPU module in which the QJ71DN91 can be installed and the number of modules that can be installed.

Applicable module		Number of modules that can be installed	Remarks
CPU module	Q00JCPU	Maximum 16	(*1)
	Q00CPU Q01CPU	Maximum 24	
	Q02CPU Q02HCPU Q06HCPU Q12HCPU Q25HCPU	Maximum 64	Can be installed in Q mode only (*1)
	Q12PHCPU Q25PHCPU	Maximum 64	(*1)

*1 See User's Manual (Function Explanation, Program Fundamentals) for the CPU module to use.

(2) Base unit in which the conversion module can be installed

The QJ71DN91 can be installed in any I/O slot (*2) of the base unit. However, a power shortage may occur depending on the combination with other installed modules and the number of modules used, so always take into consideration the power supply capacity when installing modules.

*2 Limited to the range of the number of I/O points in the CPU module.

(3) Compatibility with a multiple PLC system

First read the QCPU (Q mode) (Function Explanation, Program Fundamentals) User's Manual if the QJ71DN91 is used with a multiple PLC system.

(a) Compatible QJ71DN91

Use a QJ71DN91 with function version B or higher if using the module in a multiple PLC system.

(b) Intelligent function module parameters

Perform PLC write of the intelligent function module parameters to the control PLC of the QJ71DN91 only.

(4) Software packages supported

Correspondence between systems which use QJ71DN91s and software packages are as shown below.

The GX Developer is necessary when using a QJ71DN91.

		Software Version	
		GX Developer	GX Configurator-DN ＊2
Q00J/Q00/ Q01CPU	Single PLC system	Version 7 or later	Version 1.10L or later
	Multiple PLC system	Version 8 or later	
Q02/Q02H/ Q06H/Q12H/ Q25HCPU	Single PLC system	Version 4 or later	Version 1.00A or later
	Multiple PLC system	Version 6 or later	Version 1.10B or later
Q12PH/ Q25PHCPU	Single PLC system	Version 7.10L or later	Version 1.13P or later
	Multiple PLC system		

＊2 Version 1.14Q or earlier is incompatible with Each Node Communication Error Status (addresses 1C0H to 1C3H/448 to 451). Use the product of Version 1.15R or later.

(5) Precautions on wiring

In order to avoid the effects of noise, the DeviceNet communication cable, power cable and signal lines for the I/O module should be installed in such a way that they are sufficiently away from each other.

(6) Remote operation is not allowed from other DeviceNet node

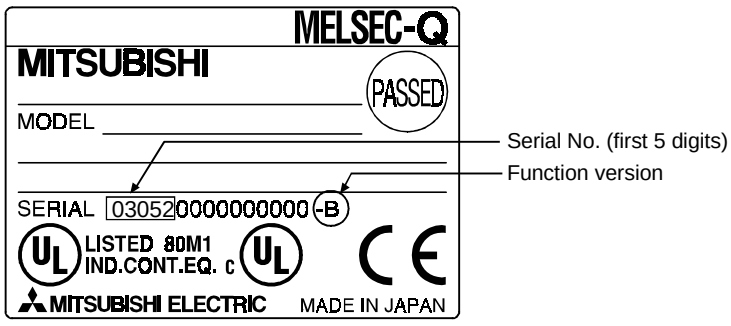
Each DeviceNet node on DeviceNet cannot read/write/monitor the sequence program or data of the PLC CPU where the QJ71DN91 is installed.

2.3 How to Check the Function Version, Serial No. and Software Version

This section describes how to check the function version and serial No. of the QJ71DN91 and the GX Configurator-DN software version.

(1) How to check the function version and serial No. of the QJ71DN91

(a) To check the version using the "SERIAL column of the rating plate" located on the side of the module



(b) To check the version using the GX Developer

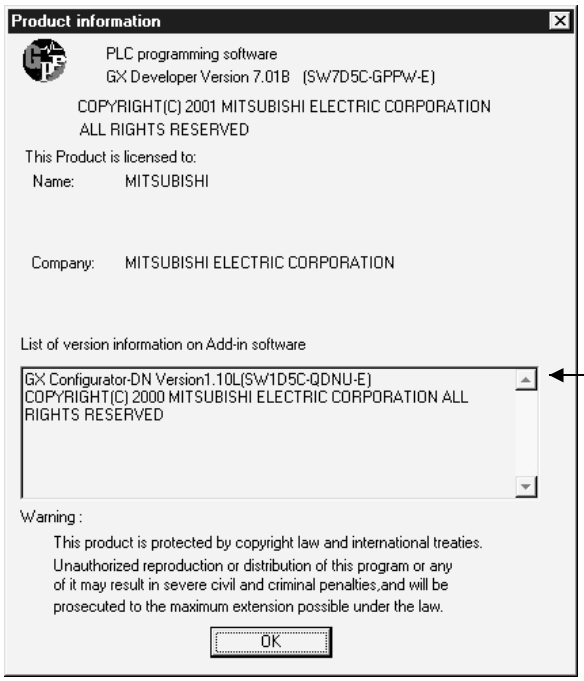
See Section 9.3 of this manual.

(2) How to check the GX Configuration-DN software version

The GX Configurator-DN software version can be checked in GX Developer's "Product information" screen.

[Startup procedure]

GX Developer → "Help" → Product information



(In the case of GX Developer Version 7)

2.4 About Use of the QJ71DN91 with the Q00J/Q00/Q01CPU

Here, use of the QJ71DN91 with the Q00J/Q00/Q01CPU is explained.

(1) Number of QJ71DN91 that can be installed when the Q00J/Q00/Q01CPU is used.

See item 2.2 concerning the number of QJ71DN91 that can be installed when the Q00J/Q00/Q01CPU is used.

(2) Limitations when using the Q00J/Q00/Q01CPU

When using Q00J/Q00/Q01CPU, use QJ71DN91 which function version is B and first 5 digits of the serial No. is 03052 or later.

2.5 About Additional Function

The added function is described below.

Function	Serial No.	Function Outline	Reference Section
Addition of Each Node Communication Error Status (addresses 01C0H to 01C3H /448 to 451)	First five digits of serial No. are 04102 or later	Indicates whether an I/O communication error has occurred or not in each node.	Section 3.4.1 (10)

POINT

Refer to Section 2.3 for the way to confirm the serial No.

2.6 Compatible DeviceNet Products from Other Manufacturers

It is assumed that most of the DeviceNet products on the market are compatible.
However, compatibility with the products of other manufacturers is not guaranteed.

3 SPECIFICATIONS

3.1 Performance Specifications

This section explains the performance specifications for QJ71DN91, I/O signals for PLC CPU and specifications for buffer memory.
See the PLC CPU User's Manual to be used for the general specifications for QJ71DN91.

<table>
<tr><th colspan="6">Item</th><th colspan="6">Specifications</th></tr>
<tr><td rowspan="15">Communication specifications</td><td rowspan="7">When master function</td><td colspan="3">Node type</td><td colspan="6">Device net master (Group 2 only client)</td></tr>
<tr><td colspan="3">Node numbers which can be set</td><td colspan="6">0 to 63</td></tr>
<tr><td rowspan="2">Number of connections that be created</td><td colspan="2">Message connection</td><td colspan="6">63</td></tr>
<tr><td colspan="2">I/O connection</td><td colspan="6">63 (polling, bit strobe, change of state, cyclic)</td></tr>
<tr><td rowspan="4">Amount of communication data</td><td rowspan="2">I/O communication</td><td>Send</td><td colspan="6">Max. 4096 points (512 bytes), max. 256 bytes per 1 node</td></tr>
<tr><td>Receive</td><td colspan="6">Max. 4096 points (512 bytes), max. 256 bytes per 1 node</td></tr>
<tr><td rowspan="2">Message communication</td><td>Send</td><td colspan="6">Max. 240 bytes</td></tr>
<tr><td>Receive</td><td colspan="6">Max. 240 bytes</td></tr>
<tr><td rowspan="6">When slave function</td><td colspan="3">Node type</td><td colspan="6">Device net slaves (Group 2 server)</td></tr>
<tr><td colspan="3">Setting possible node number</td><td colspan="6">0 to 63</td></tr>
<tr><td rowspan="2">Number of connections that can be created</td><td colspan="2" rowspan="2">I/O connection</td><td colspan="6" rowspan="2">1 (polling)</td></tr>
<tr></tr>
<tr><td rowspan="2">Amount of communication data</td><td rowspan="2">I/O communication</td><td>Send</td><td colspan="6">Max. 1024 points (128 bytes)</td></tr>
<tr><td>Receive</td><td colspan="6">Max. 1024 points (128 bytes)</td></tr>
<tr><td colspan="3">Communications speed</td><td colspan="6">One speed can be selected from 125 kbps, 250 kbps and 500kbps.</td></tr>
<tr><td colspan="3" rowspan="4">Maximum cable length ＊</td><td rowspan="2">Communications speed</td><td colspan="3">Maximum transmitting distance of trunk line</td><td colspan="2">Length of drop line</td></tr>
<tr><td>Thick Cables</td><td>Thin Cables</td><td>Thick and thin cables coexist</td><td>Maximum</td><td>Total</td></tr>
<tr><td>125 kbaud</td><td>500 m</td><td rowspan="3">100 m</td><td rowspan="3">See 3.1.1</td><td rowspan="3">6 m</td><td>156 m</td></tr>
<tr><td>250 kbaud</td><td>250 m</td><td>78 m</td></tr>
<tr><td>500 kbaud</td><td>100 m</td><td>39 m</td></tr>
<tr><td colspan="3">Current consumption required on the network</td><td colspan="6">0.03 A</td></tr>
<tr><td colspan="6">Number of times to write flash ROM</td><td colspan="6">Max. 100000 times</td></tr>
<tr><td colspan="6">No. of I/O occupied points</td><td colspan="6">32 points (I/O allocation: Intelligent 32 points)</td></tr>
<tr><td colspan="6">5 V DC internal current consumption</td><td colspan="6">0.17 A</td></tr>
<tr><td colspan="6">Weight</td><td colspan="6">0.11 kg</td></tr>
</table>

＊: The maximum cable length complies with that in the device net specification (Release 2.0) Volumes 1 and 2.

3.1.1 Maximum transmitting distance when thick and thin cables coexist

The table below lists both the maximum transmitting distance when thick and thin cables coexist.

Communication speed	Maximum transmitting distance of trunk line when thick and thin cables coexist
125 kbaud	Thick cable length + 5 × Thin Cable length ≤ 500 m
250 kbaud	Thick cable length +2.5 × Thin cable length ≤ 250 m
500 kbaud	Thick cable length + Thin cable length ≤ 100 m

3.2 Functions

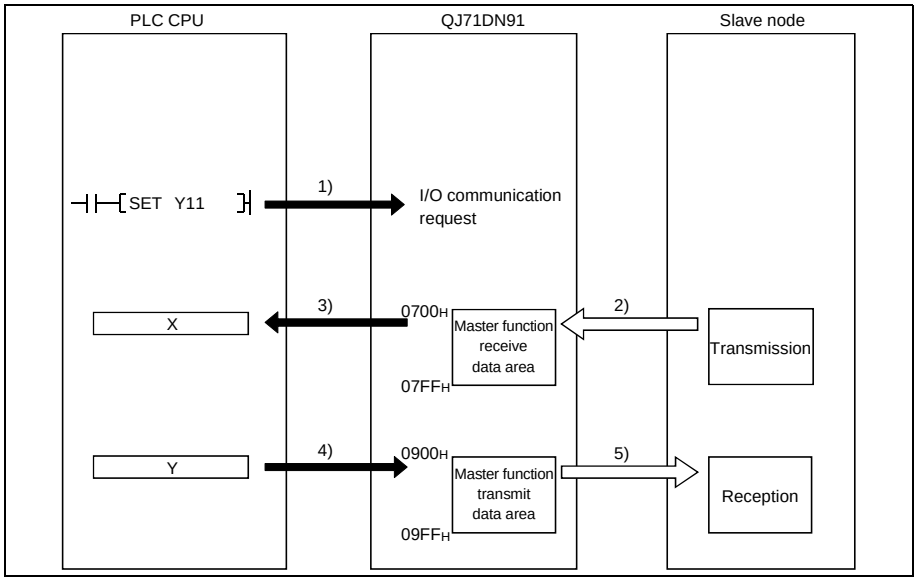
This section explains the functions of the QJ71DN91.

3.2.1 Master function (I/O communication function)

The I/O communication function executes the I/O data communication with each slave node.
In the I/O communication function, the connection type can be set according to the specification of the slave node.
There are four connection types: polling, bit strobe, change-of-state, and cyclic. The connection type can be set with a parameter.

(1) When GX Configurator-DN is used

The following explains the I/O communication function when the GX Configurator-DN is used.



[I/O communication]

1) When the I/O communication request (Y11) is set, the I/O communication with each slave node starts. It is not necessary to set Y11, however, when the auto communication start is set with a parameter.

[Reception data]

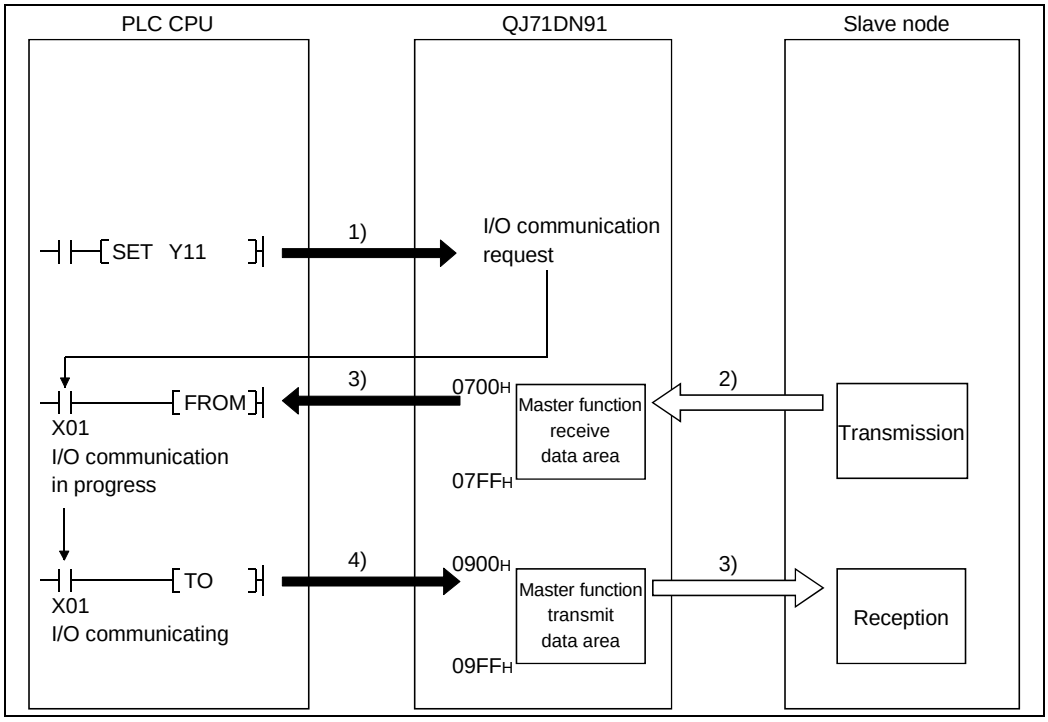
2) The input status from each slave node is automatically stored in the "master function reception data" area of the buffer memory in the QJ71DN91.
3) The input status stored in the "master function reception data" area of the buffer memory is loaded onto the PLC CPU by the auto refresh setting.

[Transmission data]

4) The ON/OFF information to be sent to the slave node is written into the "master function transmission data" area of the buffer memory by the auto refresh setting.
5) The ON/OFF information stored in the "master function transmission data" area is automatically sent to a slave node.

(2) When the sequence program is used

The following explains the I/O communication function when the sequence program is used.



[I/O communication]

1) When the I/O communication request (Y11) is set, the I/O communication with each slave node starts. It is not necessary to set Y11, however, when the auto communication start is set with a parameter.

[Reception data]

2) The input status from each slave node is automatically stored in the "master function receive data" area of the buffer memory in the QJ71DN91.
3) The input status stored in the "master function receive data" area of the buffer memory is loaded onto the PLC CPU by the FROM instruction of the sequence program.

[Transmission data]

4) The ON/OFF information to be sent to the slave node is written into the "master function transmit data" area of the buffer memory by the TO instruction of the sequence program.
5) The ON/OFF information stored in the "master function transmit data" area is automatically sent to the slave node.

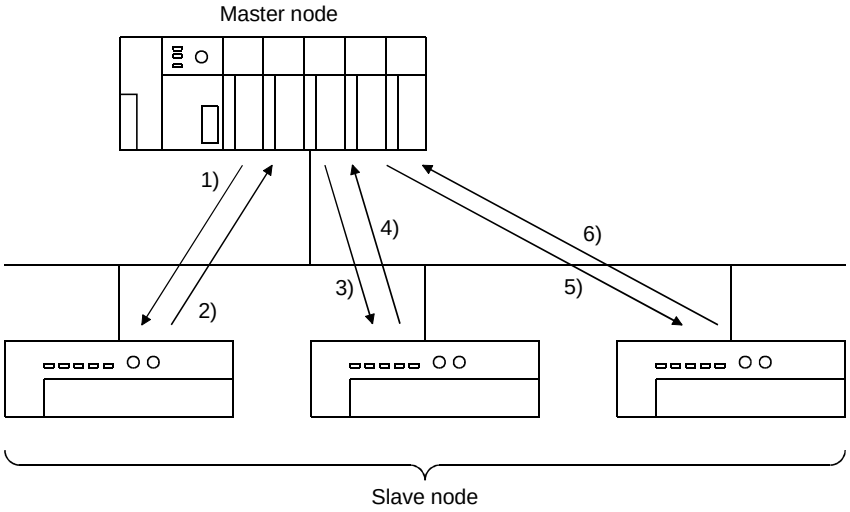
(3) Overview of each connection type

The following explains an overview of each connection type used during the I/O communication.

(a) Polling

As shown in the following diagram, the communication method by which the communication with each slave node is repeated, as described from 1) to 6), is the polling communication. The connection that uses this communication is the polling connection.

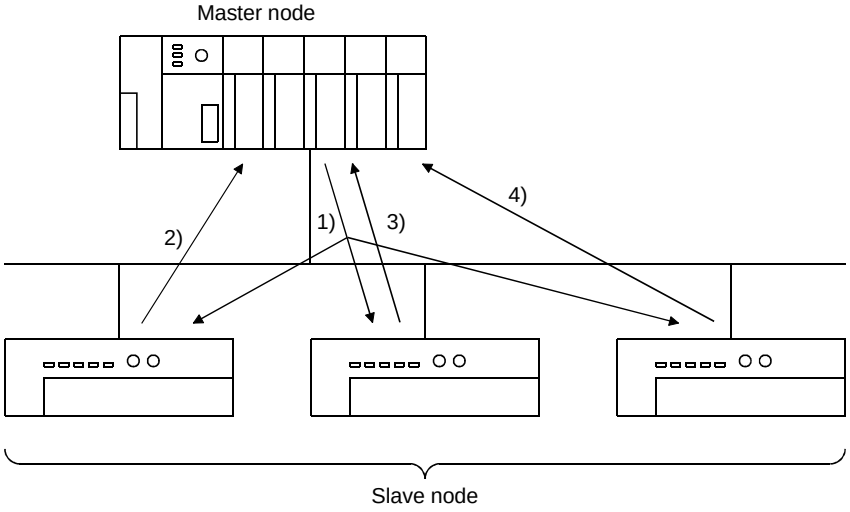
1) The master node transmits the output data.
2) The slave node transmits input data by setting 1) to trigger.
3) The master node transmits the output data.
4) The slave node transmits input data by setting 3) to trigger.
5) The master node transmits the output data.
6) The slave node transmits input data by setting 5) to trigger.



(b) Bit strobe

As shown in the following diagram, the communication method by which the communication with each slave node is repeated, as described from 1) to 4), is the bit strobe communication. The connection that uses this communication is the bit strobe connection.

1) Output information of a maximum of one bit is transmitted simultaneously to each slave node.
2) The slave node transmits the input data by setting the transmission of 1) to trigger.
3) The slave node transmits the input data by setting the transmission of 1) to trigger.
4) The slave node transmits the input data by setting the transmission of 1) to trigger.



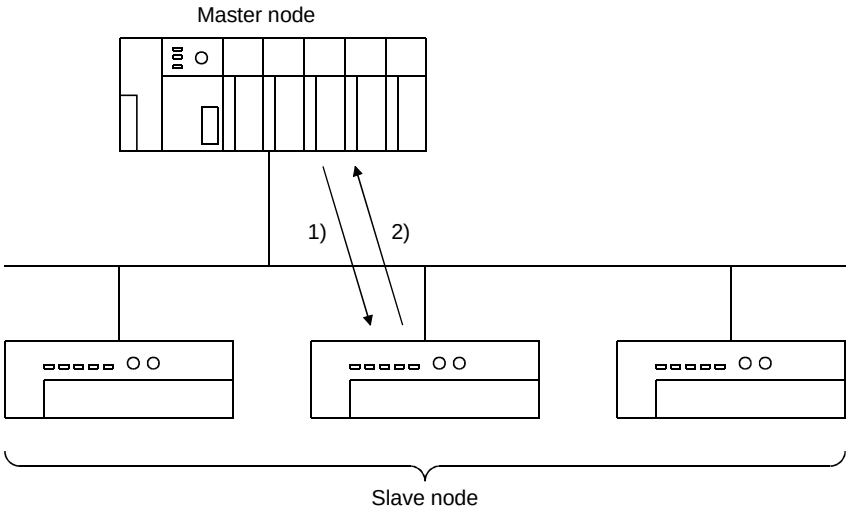
(c) Change-of-state

As shown in the following diagram, the communication method that executes the communication of [1] and [2] as the I/O data changes is the change-of-state communication, and the connection that uses this communication is the change-of-state connection.

No data transmission is performed unless the I/O data is changed.

1) When the output data of the master node changes, the data is sent to the slave node.
2) When the input data of the slave node changes, the data is sent to the master node.

There is no concept of the network scan in the change-of-state communication.



(d) Cyclic

As shown in the following diagram, the communication method that regularly repeats the communication of [1] and [2] is the cyclic communication, and the connection that uses this communication is the cyclic connection.

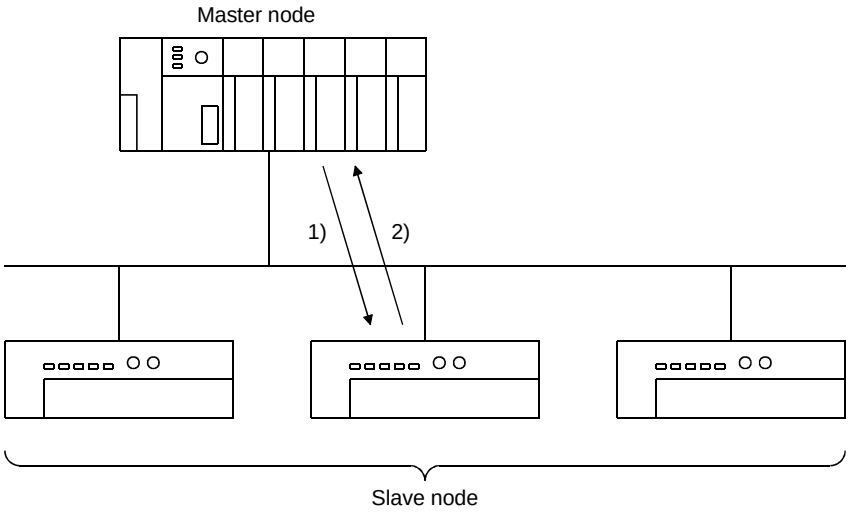
1) The data of the master node is sent to the slave node.
2) The data of the slave node is sent to the master node.

The cycle of the cyclic communication can be specified for each slave node.

Specify the cycle of the cyclic communication in the following parameter items:

Transmission cycle from master node: Production inhibit time
Transmission cycle from slave node: Expected packet rate

There is no concept of the network scan in the cyclic communication.



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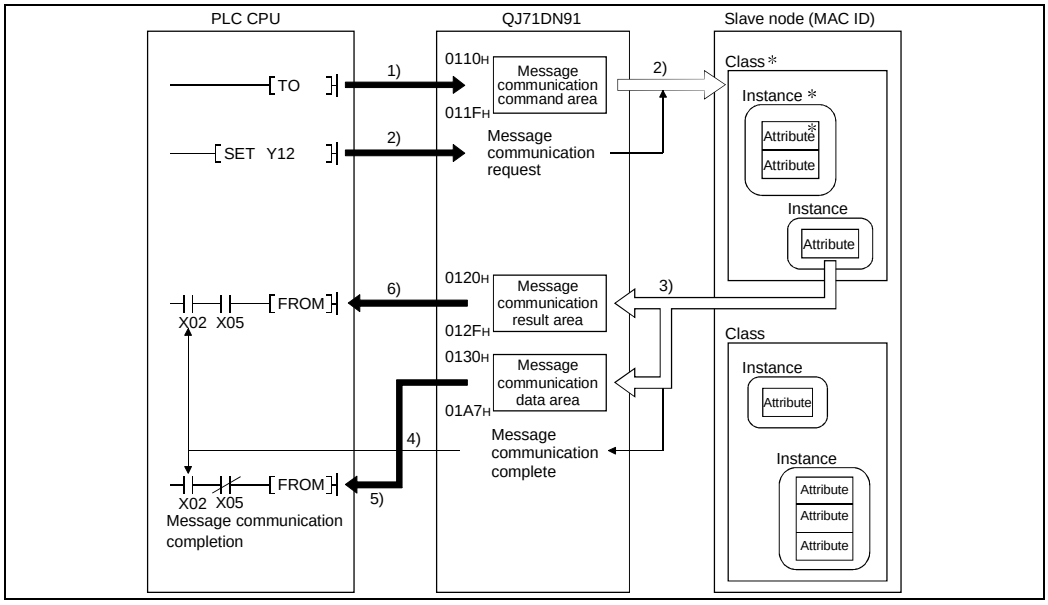
3.2.2 Master function (Message communication function)

The message communication function is used to get and set the attribute data of a slave node.

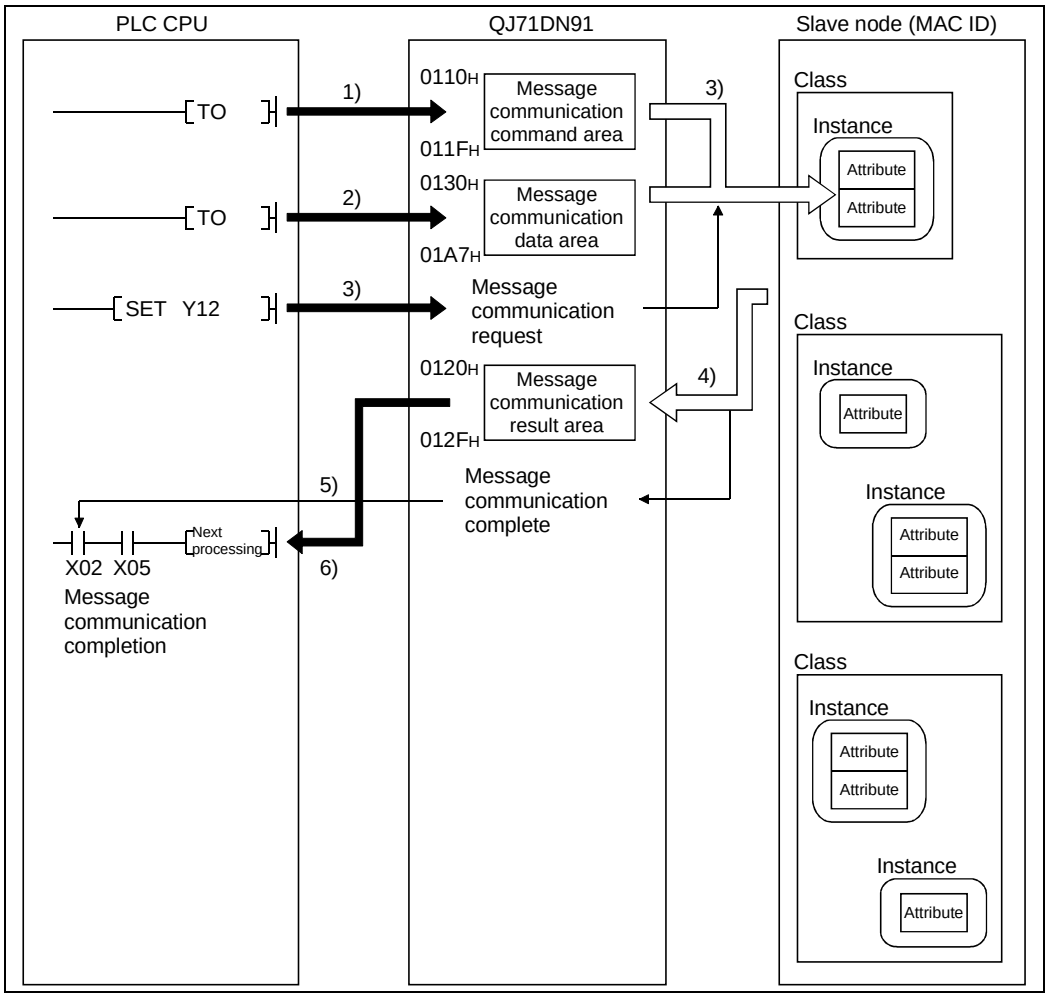
(1) Getting attributes



*: In DeviceNet, the area used for reading and writing via communication is specified by the numbers representing the class ID, instance ID, and attribute ID. For details, refer to the manual of each slave node.

1) The TO instruction of the sequence program sets to get attributes in the "message communication command" area of the buffer memory.
2) When the message communication request (Y12) is turned ON by the sequence program, the data, which is set in the "message communication command" area in the buffer memory, is sent to the slave node and the message communication starts.
3) When the QJ71DN91 receives data from the slave node, it is processed as follows:
   - The specific data of the slave node that is set in the "message communication command" area is stored in the "message communication data" area of the buffer memory.
   - The processing result of message communication is stored in the "message communication result" area of the buffer memory.
4) The message communication is completed when the processing result is stored in the "message communication result" area of the buffer memory, and the message communication completion (X02) is automatically turned ON.
5) Upon normal completion, the data in the slave node, which is stored in the "message communication data" area of the buffer memory, is loaded onto the PLC CPU by the FROM instruction of the sequence program.
6) If the message communication error signal (X05) is turned ON, the FROM instruction reads the contents of the "message communication result" area, and the cause of the error is verified.

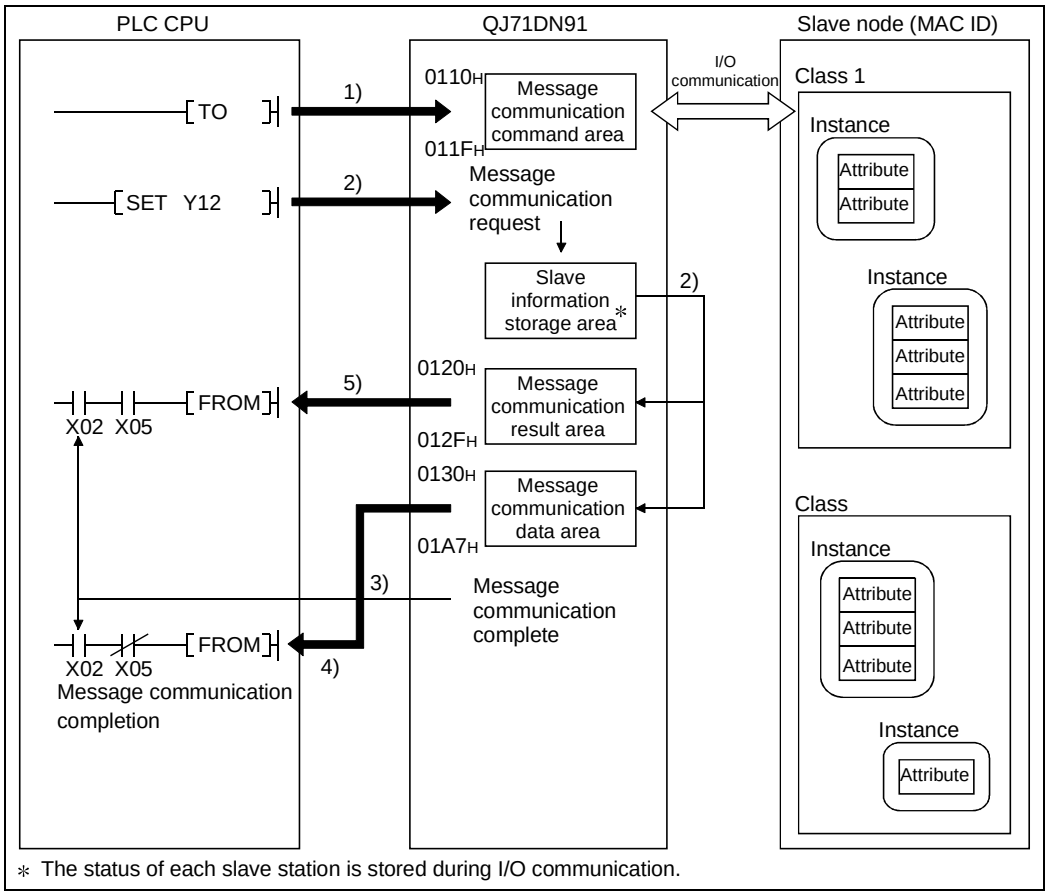
(2) Setting attributes



1) The TO instruction of the sequence program sets to set attributes in the "message communication command" area of the buffer memory.
2) The TO instruction of the sequence program writes the data to be written in the "message communication data" area of the buffer memory.
3) When the message communication request (Y12) is turned ON, the data, which is stored in the "message communication data" area of the buffer memory, is written to the slave node in the area specified by the "message communication command."
4) When the write process is finished, the message communication result is stored in the "message communication result" area of the buffer memory.
5) The message communication is completed when the processing result is stored in the "message communication result" area of the buffer memory, and the message communication completion (X02) is automatically turned ON.
6) If the message communication error signal (X05) is turned ON, the FROM instruction reads the contents of the "message communication result" area, and the cause of the error is verified.

3 - 9

(3) Reading the communication error information



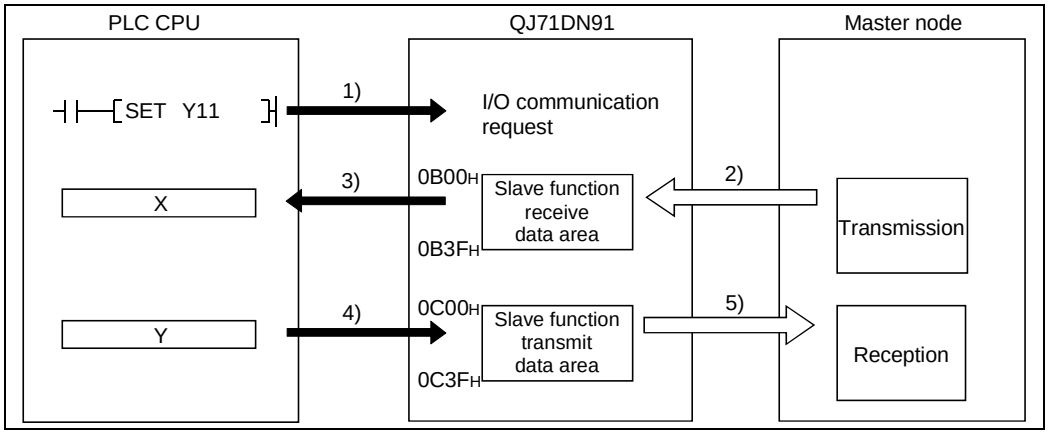
1) The TO instruction of the sequence program sets to read the communication error information in the "message communication command" area of the buffer memory.
2) When the message communication request (Y12) is turned ON by the sequence program, the error information of the applicable slave node that has been accumulated in the QJ71DN91 is read and processed as follows:
   - The error information of the slave node that was set by the "message communication command" area is stored in the "message communication data" area of the buffer memory.
   - The processing result of the message communication is stored in the "message communication result" area of the buffer memory.
3) When the processing result is stored in the "message communication result" area of the buffer memory, the message communication completion (X02) is automatically turned ON.
4) The communication error information of the slave node, which is stored in the "message communication data" area of the buffer memory, is loaded onto the PLC CPU by the FROM instruction of the sequence program.
5) If the message communication error signal (X05) is turned ON, the FROM instruction reads the contents of the "message communication result" area, and the cause of the error is verified.

3.2.3 Slave function (I/O communication function)

The I/O communication function executes the communication of the I/O data with the master node using the polling method.

(1) When GX Configurator-DN is used

The following explains the I/O communication function when the GX Configurator-DN is used.



[I/O communication]

1) Communication with the master node starts when the I/O communication request (Y11) is turned ON.

[Reception data]

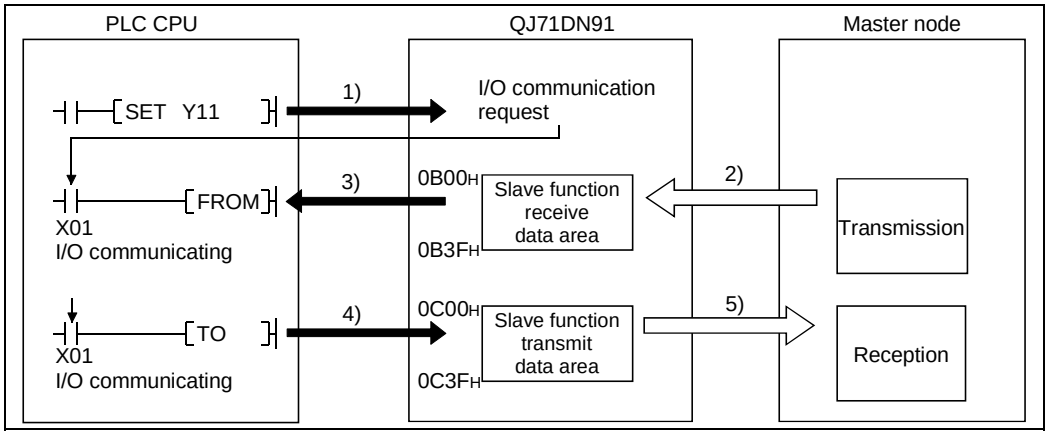
2) Transmission data from the master node is automatically stored in the "slave function receive data" area of the buffer memory in the QJ71DN91.
3) Transmission data from the mater node, which is stored in the "slave function receive data" area of the buffer memory, is loaded onto the PLC CPU by the auto refresh setting.

[Transmission data]

4) With the auto refresh setting, the ON/OFF information to be sent to the master node is written in the "slave function transmit data" area of the buffer memory.
5) The ON/OFF information, which is stored in the "slave function transmit data" area of the buffer memory, is automatically sent to the master node.

(2) When the sequence program is used

The following explains the I/O communication function when the sequence program is used.



[I/O communication]

1) Communication with the master node starts when the I/O communication request (Y11) is turned ON.

[Reception data]

2) Transmission data from the master node is automatically stored in the "slave function receive data" area of the buffer memory in the QJ71DN91.
3) The transmission data from the master node, which is stored in the "slave function receive data" area of the buffer memory, is loaded onto the PLC CPU by the FROM instruction of the sequence program.

[Transmission data]

4) The TO instruction of the sequence program writes the ON/OFF information to be sent to the master node in the "slave function transmit data" area of the buffer memory.
5) The ON/OFF information, which is stored in the "slave function transmit data" area of the buffer memory, is automatically sent to the master node.

3.3 I/O Signals for the PLC CPU

This section explains the input/output signals for the PLC CPU of the QJ71DN91.

3.3.1 I/O signal list

The I/O signal list for the QJ71DN91 is shown in Table 3.2.
The I/O numbers (X/Y) and I/O addresses described from this chapter are applicable when the QJ71DN91 is installed in slot 0 of the basic base module.

Table 3.2 I/O signal list

QJ71DN91 → PLC CPU				PLC CPU → QJ71DN91			
Input number	Signal name	Usability		Output number	Signal name	Usability	
		Master function	Slave function			Master function	Slave function
X00	Watchdog Timer Error	○	○	Y00	Use prohibited	—	—
X01	I/O Communicating	○	○	Y01			
X02	Message Communication Completion	○	—	Y02			
X03	Master Function For Error Set Signal	○	—	Y03			
X04	Slave Down Signal	○	—	Y04			
X05	Message Communication Error Signal	○	—	Y05			
X06	Saving Parameter To The Flash ROM	○	○	Y06			
X07	Save Parameter To Flash ROM Completion	○	○	Y07			
X08	Slave Function For Error Set Signal	—	○	Y08			
X09	Use prohibited	—	—	Y09			
X0A	H/W Testing	At the time of the hardware test		Y0A			
X0B	H/W Test Completion	At the time of the hardware test		Y0B			
X0C	H/W Test Error Detection	At the time of the hardware test		Y0C			
X0D	Use prohibited	—	—	Y0D			
X0E				Y0E			
X0F	Module Ready	○	○	Y0F			
X10	Use prohibited	—	—	Y10			
X11				Y11	I/O Communication Request	○	○
X12				Y12	Message Communication Request	○	—
X13				Y13	Master Function For Error Reset Request	○	—
X14	Auto Configuration Executing	○	—	Y14	Use prohibited	—	—
X15	Auto Configuration Completion	○	—	Y15	Auto Configuration Request	○	—
X16	Use prohibited	—	—	Y16	Use prohibited	—	—
X17				Y17	Save Parameter To Flash ROM Request	○	○
X18				Y18	Slave Function For Error Reset Request	—	○
X19				Y19	Use prohibited	—	—
X1A				Y1A			
X1B				Y1B			
X1C				Y1C			
X1D				Y1D			
X1E				Y1E			
X1F				Y1F			

IMPORTANT

The use-prohibited output signals shown in Table 3.2 are accessed by the system and cannot be accessed by the user. In the event these signals are used (turned ON/OFF) by the user, normal operations cannot be guaranteed.

3.3.2 Details of the I/O signals

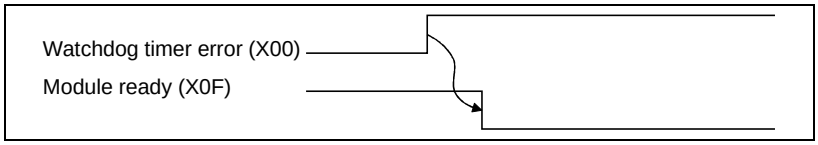
The following describes the ON/OFF timings and conditions of the I/O signals.

(1) Watchdog Timer Error: X00

This is turned ON when an error occurs in the QJ71DN91.

OFF: Module normal

ON: Module error



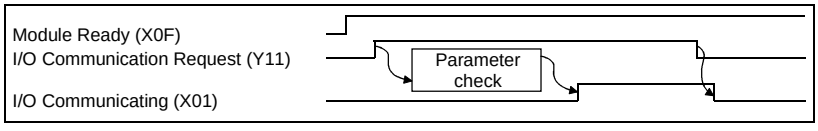
(2) I/O Communicating: X01, I/O Communication Request: Y11 (when the master function is used)

This signal is used to start the I/O communication of the master function with the parameters set by the "parameters for the master function" of the buffer memory. Use this signal while the module ready (X0F) is ON.

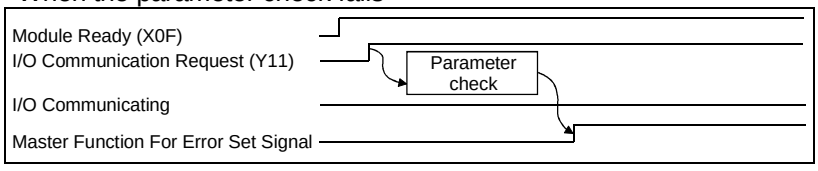
(a) When the auto start is not set:

1) Verify that the auto configuration request (Y15) and the save parameter to flash ROM request (Y17) are OFF.
2) To start the I/O communication, use the sequence program to turn ON the I/O communication request (Y11).
3) When the I/O communication request (Y11) is turned ON, the parameter check is executed. If the parameter check is successful, the I/O communication starts and the I/O Communicating (X01) is turned ON. If the parameter check fails, the master function for error set signal (X03) is turned ON and the ERR. LED is lit. Check the contents of the error with the "error information for the master function" of the buffer memory address 1B1H.
4) To stop the I/O communication, use the sequence program to turn OFF the I/O communication request (Y11).
5) I/O communication stops and the I/O communicating (X01) is turned OFF.

When the parameter check is successful



When the parameter check fails



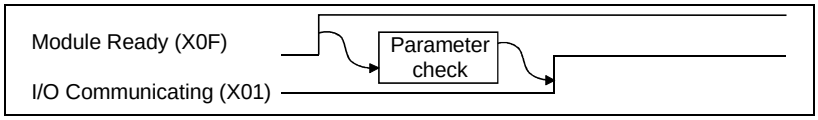
(b) When the auto start is set

1) The module ready (X0F) is turned ON when the power is turned ON, and the parameter check is executed automatically.
2) If the parameter check is successful, the I/O communication starts and the I/O communicating (X01) is turned ON. If the parameter check fails, the master function for error set signal (X03) is turned ON and the ERR. LED is lit. Check the contents of the error with the "master function for error information" of the buffer memory address 1B1H.

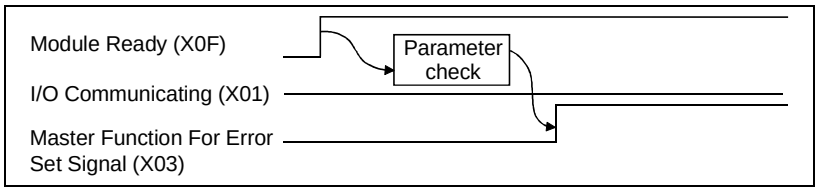
POINT

To stop the I/O communication, set Y11, then reset after 200 ms or longer.

When the parameter check is successful:



When the parameter check fails:



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(3) I/O Communicating : X01, I/O Communication Request: Y11 (when the slave function is used)

These signals are used to start the I/O communication of the slave function with the number of I/O points that is set by the "setting area of the number of slave function reception bytes" and the "setting area of the number of slave function transmission bytes" of the buffer memory.
Use these signals while the module ready (X0F) is ON.

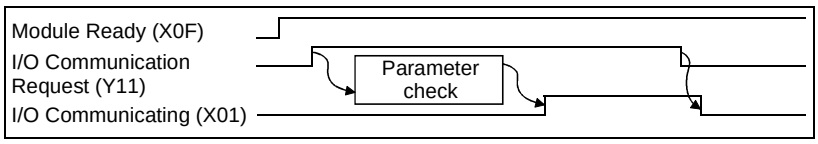
(a) To start the I/O communication, use the sequence program to turn ON the I/O communication request (Y11).

(b) When the I/O communication request (Y11) is turned ON, the parameter check is executed. If the parameter check is successful, the I/O communication starts and the I/O communicating (X01) is turned ON. If the parameter check fails, the slave function for error set signal (X08) is turned ON and the ERR. LED is lit. Check the contents of the error with the "error information for the slave function" of the buffer memory address 601H.

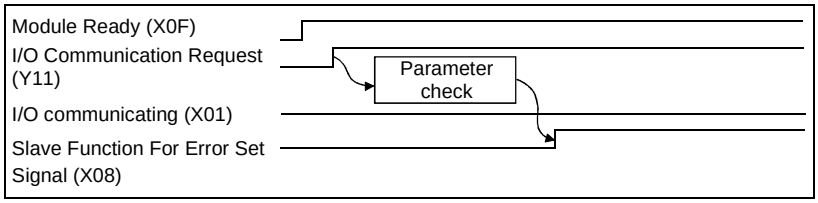
(c) To stop the I/O communication, use the sequence program to turn OFF the I/O communication request (Y11).

(d) The I/O communication stops and the I/O communicating (X01) is turned OFF.

When the parameter check is successful:



When the parameter check fails:



3 - 16

(4) Message Communication Completion: X02, Message Communication Error Signal: X05, Message Communication Request: Y12

These signals are used to execute the message communication. Message communication can be executed when the "master function communication status" area of the buffer memory is "in operation ($C0_H$)" or "stop (40_H)".

POINT
When making message communication, set the master function parameters. If the master function parameters have not been set, a message connection is opened using message group 1.

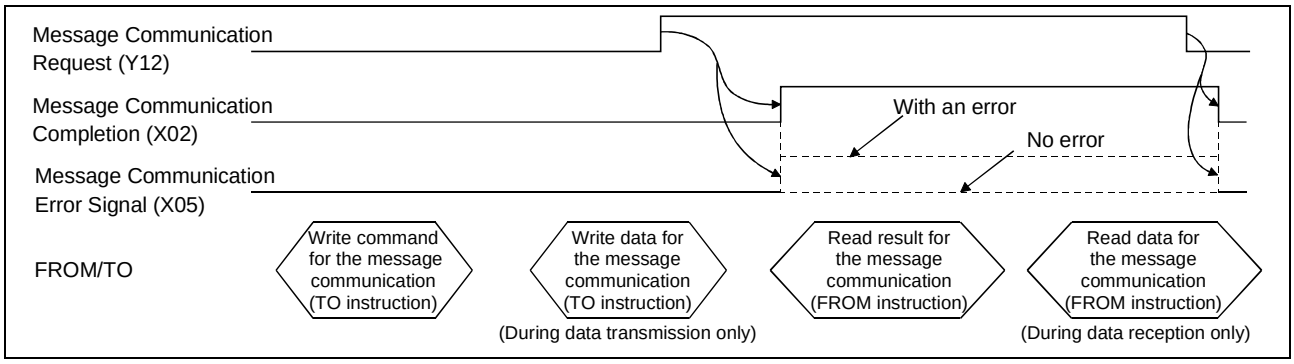
(a) The procedure for executing the message communication is as follows:

1) Write the message communication data into the "message communication command" area of the buffer memory.
2) Use the sequence program to turn ON the message communication request (Y12).
   (Set an interval of 100 ms or longer before turning ON the message communication request.)

(b) The message communication is completed. The communication result is written into the "message communication result" area, and the message communication completion (X02) is turned ON.

(c) Check the message communication result with the message communication error signal (X05).

(d) After reading the communication data by the FROM instruction, use the sequence program to turn OFF the message communication request (Y12). The message communication completion (X02) and the message communication error signal (X05) are automatically turned OFF.

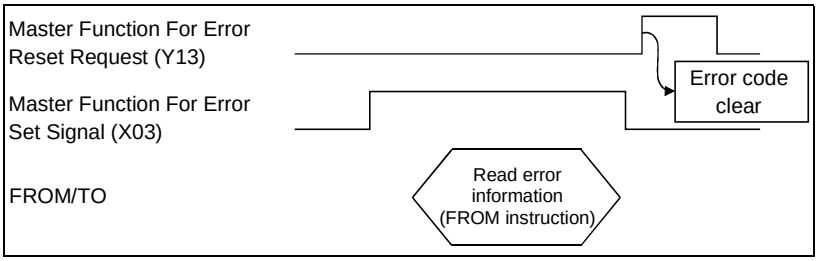


(5) Master Function For Error Set Signal: X03, Master Function For Error Reset Request: Y13

These signals are used to indicate an error while executing the master function and to reset the error code.

(a) When an error occurs via the master function, the error information is stored in the "error information for the master function" area of the buffer memory and the master function for error set signal (X03) is turned ON.
The master function for error set signal is automatically turned OFF when the error cause is removed.

(b) After removing the error cause, use the sequence program to turn ON the master function for error reset request (Y13), and the error code of the "error-information for the master function" area is cleared.



(6) Slave Down Signal: X04

This signal indicates whether or not a slave node that is being stopped for communication exists.

(a) This signal is turned ON when at least one slave node is being stopped among the slave nodes that are set by the parameters.
OFF: Normal communication with all nodes
ON: A communication-error node exists.
The slave node that is being sopped can be checked by referring to the "each node's communication status" area in the addresses $01BC_H$ to $01BF_H$ of the buffer memory.

(b) X04 is automatically turned OFF when communication with the slave node that is being stopped resumes.

(7) Saving Parameter To Flash ROM: X06, Save Parameter To Flash ROM Completion: X07, Save Parameter To Flash ROM Request: Y17 (when the master function is used)

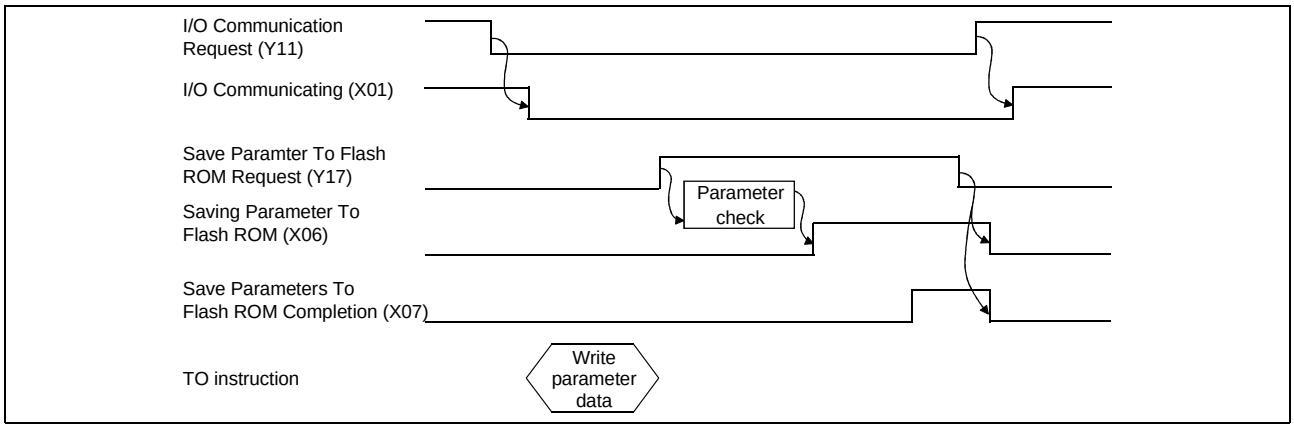
These signals are used to save the "parameters for the master function" of the buffer memory to the flash ROM in the QJ71DN91. Make a request to save parameters to the flash ROM while the I/O communicating (X01) is OFF.

(a) Set the parameters using the following steps:
1) Write the parameters in the "parameters for the master function" area of the buffer memory.
2) Set the parameter save area selection bit.
3) Use the sequence program to turn ON the save parameter to flash ROM request (Y17).

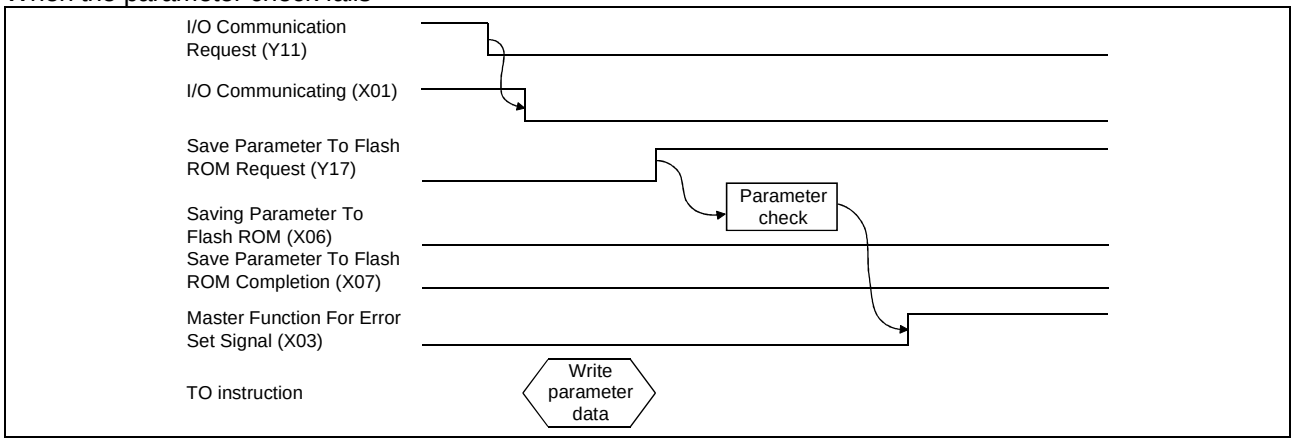
(b) When the request to save parameters to the flash ROM is accepted, and if the parameter check is successful, the parameters will be saved and the saving parameter to the flash ROM (X06) will turn ON. If the parameter check fails, the master function for error set signal (X03) will turn ON and the ERR. LED will light. Check the contents of the error in the "error information for the master function" of the buffer memory address 1B1H.

(c) When the saving parameters to the flash ROM is completed, the save parameter to flash ROM completion (X07) signal is automatically turned ON. Communications with other slave nodes are stopped while the parameter is being set.
By turning OFF the request to save parameters to the flash ROM, the saving parameter to the flash ROM complete is automatically turned OFF.

When the parameter check is successful



When the parameter check fails



POINT

(1) Even if the save parameter to flash ROM request (Y17) is turned ON while the I/O communicating (X01) is ON, save parameter to flash ROM completion (X07) is not turned ON. Turn OFF the I/O communication request (Y11), then after confirming that the I/O communicating (X01) is OFF, turn ON the save parameter to flash ROM request (Y17) from the OFF state.
(2) Even if the I/O communication request (Y11) is turned ON while the save parameter to flash ROM request (Y17) is ON, the I/O communicating (X01) is not turned ON. Turn OFF the save parameter to flash ROM request (Y17), then turn OFF the I/O communication request (Y11) once and turn it back ON again.

(8) Saving Parameter To Flash ROM: X06, Save Parameter To Flash ROM Completion: X07, Save Parameter To Flash ROM Request: Y17 (when the slave function is used)

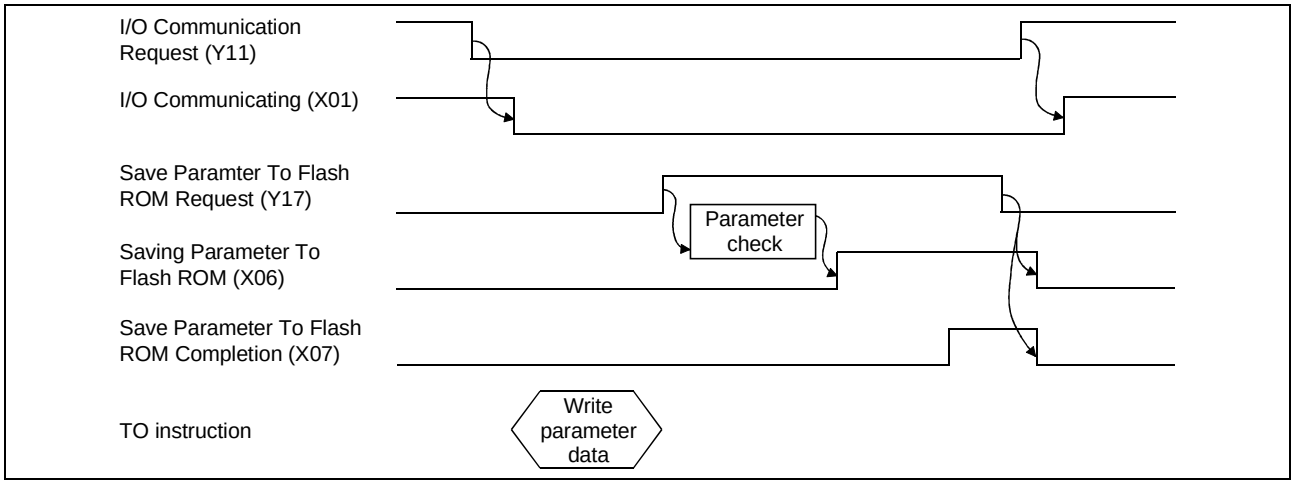
These signals are used when saving the "setting area for the number of slave function input points" and "setting area for the number of slave function output points" of the buffer memory to the flash ROM in the QJ71DN91. Make a request to save parameters to the flash ROM while the I/O communicating (X01) is OFF.

(a) Set the parameters using the following steps:
1) Write the parameter in the "setting area of the number of slave function reception bytes" and the "setting area of the number of slave function transmission bytes" of the buffer memory.
2) Set the parameter save area selection bit.
3) Use the sequence program to turn ON the save parameter to flash ROM request (Y17).

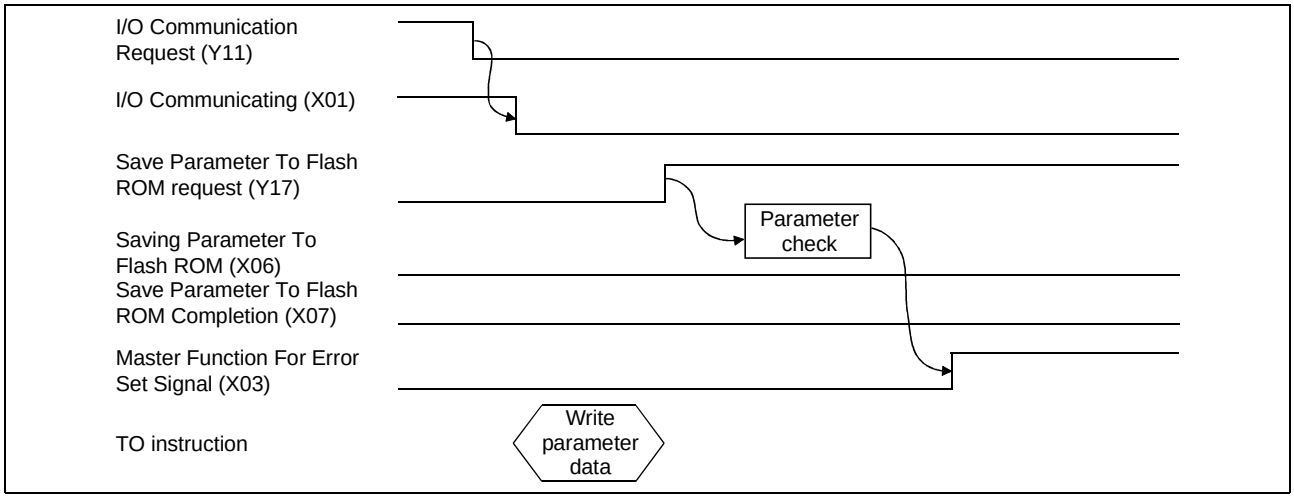
(b) When the request to save parameters to the flash ROM is accepted, and if the number of I/O points check is successful, the number of I/O points setting will be saved and the save parameter to flash ROM (X06) will turn ON. If the number of I/O points check fails, the slave function for error set signal (X08) is turned ON and the ERR. LED is lit. Check the contents of the error in the "error information for the slave function" of the buffer memory address 601H.

(c) When the number of I/O points setting is saved in the flash ROM, the save parameter to flash ROM completion (X07) is automatically turned ON. Communication with the master node is stopped while the number of I/O points setting is being saved.
By turning OFF the request to save parameters to the flash ROM, the saving parameters to the flash ROM complete is automatically turned OFF.

When the parameter check is successful



When the parameter check fails:



POINT

(1) Even if the save parameter to flash ROM request (Y17) is turned ON while the I/O communicating (X01) is ON, save parameter to flash ROM completion (X07) is not turned ON. Turn OFF the I/O communication request (Y11), then after confirming that the I/O communicating (X01) is OFF, turn ON the save parameter to flash ROM request (Y17) again from the OFF state.

(2) Even if the I/O communication request (Y11) is turned ON while the save parameter to flash ROM request (Y17) is ON, the I/O communicating (X01) is not turned ON. Turn OFF the save parameter to flash ROM request (Y17), then turn OFF the I/O communication request (Y11) once and turn it back ON again.

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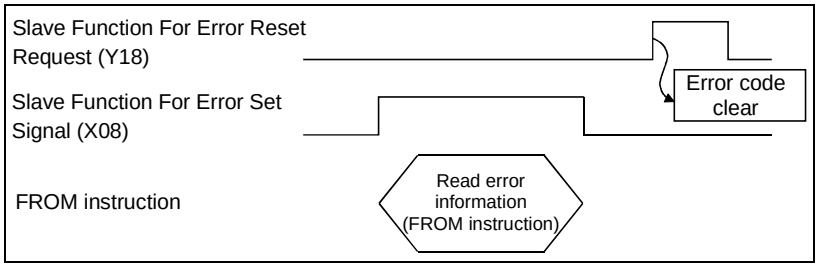
(9) Slave Function For Error Set Signal: X08, Slave Function For Error Reset Request: Y18

These signals notify an error occurrence during execution of the slave function and are used to reset the error code.

(a) When an error occurs by the slave function, the error information is stored in the "error information for the slave function" area of the buffer memory, and the slave function for error set signal (X08) is turned ON.
The slave function for error set signal is automatically turned OFF when the error cause is removed.

(b) After removing the error cause, use the sequence program to turn ON the slave function for error reset request (Y18). The error code of the "error information for the slave function" area will be cleared.



(10) H/W Testing: X0A, H/W Test Completion: X0B, H/W Test Error Detection: X0C

These signals indicate the status when the QJ71DN91 is set to the hardware test mode (mode 9).

(a) When the mode switch is set to 9 and the power is turned ON, the H/W testing (X0A) is turned ON.

(b) When the hardware test is completed normally, the H/W test completion (X0B) signal will be turned ON. If an error occurs, the H/W test completion (X0B) signal will not be turned ON but the H/W test error detection (X0C) will be turned ON.

(11) Module Ready: X0F

This signal indicates whether the module is ready to operate.
When the module reaches ready-to-operate status, this signal is turned ON automatically.
The module ready (X0F) is turned OFF when the watchdog timer error (X00) is turned ON.

(12) Auto Configuration Executing: X14, Auto Configuration Completion: X15, Auto Configuration Request: Y15

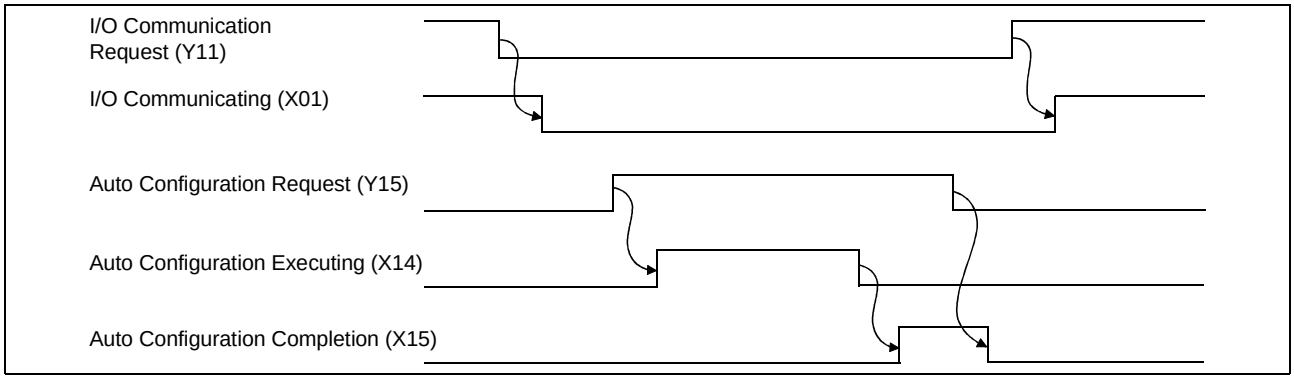
These signals are used in order to search the slave nodes that are connected to the network and create parameters automatically. Execute the auto configuration request while the I/O communicating (X01) is OFF.

(a) Verify that the DeviceNet device power and the network power are turned ON.

(b) To execute the auto configuration, turn ON the auto configuration request (Y15).

(c) The auto configuration starts and the auto configuration executing (X14) is turned ON.

(d) When the auto configuration is completed, the auto configuration executing (X14) is turned OFF and the parameters generated by auto configuration processing is stored in the "parameters for the master function" area of the buffer memory, and the auto configuration completion (X15) is turned ON.



POINT

(1) Confirm that the I/O communication request (Y11) is turned OFF. When Y11 is turned OFF, not only the I/O communication of the master function, but also the I/O communication of the slave function stops.

(2) The I/O communicating (X01) is not turned ON even if the I/O communication request (Y11) is turned ON while the auto configuration request (Y15) is ON. Turn OFF the auto configuration request (Y15), then turn OFF the I/O communication request (Y11) once, then turn it back ON again.

(3) For the parameters created by auto configuration, be sure to verify that the contents are correct.

3.4 Buffer Memory

The buffer memory transfers data between the QJ71DN91 and the PLC CPU.
The FROM and TO instructions of the PLC CPU are used to read and write the buffer memory data in the QJ71DN91.
The contents of the buffer memory are reset to 0 when the power is turned OFF or when the PLC CPU is reset.
However, the "parameter" area is initialized using the saved parameters if the parameters have been saved in the flash ROM.

3.4.1 Buffer memory list

The buffer memory list is shown in Table 3.3.

Table 3.3 Buffer memory list (1/2)

Address		Item	Description	Usability		Write from the PLC CPU allowed?	Reference section
Hexadecimal	Decimal			Master function	Slave function		
0000H to 010FH	256 to 271	Use prohibited	—	—	—	—	—
0110H to 011FH	272 to 287	Message communication command	Stores the request data for executing the message communication.	○	—	Yes	3.4.2 (1)
0120H to 012FH	288 to 303	Message communication result	Stores the result data of the message communication.	○	—	No	3.4.2 (2)
0130H to 01A7H	304 to 423	Message communication data	Stores the transmission and reception data of the message communication.	○	—	Yes	3.4.2 (3)
01A8H to 01AFH	424 to 431	Use prohibited	—	—	—	—	—
01B0H	432	Master Function Communication Status	Stores the communication status of the master function.	○	—	No	3.4.2 (4)
01B1H	433	Master Function For Error Information	Higher byte: Error code Lower byte: Stores the node number where the error occurred.	○	—	No	3.4.2 (5)
01B2H	434	Bus Error Counter	Stores the number of times errors are detected in the communication data.	○	—	No	3.4.2 (6)
01B3H	435	Bus Off Counter	Stores the number of communication errors.	○	—	No	3.4.2 (7)
01B4H to 01B7H	436 to 439	Each Node Configuration Status	Indicates whether or not each slave node is set with a parameter.	○	—	No	3.4.2 (8)
01B8H to 01BBH	440 to 443	Use prohibited	—	—	—	—	—
01BCH to 01BFH	444 to 447	Each Node Communication Status	Indicates whether or not each node is executing I/O communication.	○	—	No	3.4.2 (9)
01C0H to 01C3H	448 to 451	Each Node Communication Error Status	Indicates whether an I/O communication error has occurred or not in each node.	○	—	No	3.4.2 (10)
01C4H to 01C7H	452 to 455	Each Node Obstacle Status	Indicates whether or not each node has a trouble.	○	—	No	3.4.2 (11)
01C8H to 01CBH	456 to 459	Use prohibited	—	—	—	—	—
01CCH to 01CFH	460 to 463	Down Node Detection Disable Status	Sets whether or not the "slave down" signal (X04) reflects the down status of each slave node.	○	—	No	3.4.2 (12)
01D0H to 01D3H	464 to 467	Use prohibited	—	—	—	—	—
01D4H to 03CFH	468 to 975	Parameters for the master function	Area for setting parameters for the master function by the sequence program.	○	—	Yes	3.4.2 (13)
03D0H to 03EFH	976 to 1007	Use prohibited	—	—	—	—	—
03F0H	1008	Auto configuration operation setting	Sets up the operation of the auto configuration.	○	—	Yes	3.4.2 (14)
03F1H to 04FFH	1009 to 1279	Use prohibited	—	—	—	—	—
0500H to 05FBH	1280 to 1531	Master Function For I/O Address Area	Displays the address and size of each I/O data for the master function.	○	—	No	3.4.2 (15)

Table 3.3 Buffer memory list (2/2)

Address		Item	Description	Usability		Write from the PLC CPU allowed?	Reference section
Hexadecimal	Decimal			Master function	Slave function		
05FC$_H$	1532	Present Link Scan Time	Displays the current link scan time (module: ms).	○	—	No	3.4.2 (16)
05FD$_H$	1533	Minimum Link Scan Time	Displays the minimum link scan time (module: ms).	○	—	No	3.4.2 (17)
05FE$_H$	1534	Maximum Link Scan Time	Displays the maximum link scan time (module: ms).	○	—	No	3.4.2 (18)
05FF$_H$	1535	Use prohibited	—	—	—	—	—
0600$_H$	1536	Slave Function Communication Status	Stores the communication status for the slave function.	—	○	No	3.4.2 (19)
0601$_H$	1537	Slave Function For Error Information	Stores the parameter errors, etc.	—	○	No	3.4.2 (20)
0602$_H$ to 060D$_H$	1538 to 1549	Use prohibited	—	—	—	—	—
060E$_H$	1550	Setting area of the number of slave function reception bytes	Sets the number of reception bytes for the slave function (reception from master).	—	○	Yes	3.4.2 (21)
060F$_H$	1551	Setting area of the number of slave function transmission bytes	Sets the number of transmission bytes for the slave function (transmission to master).	—	○	Yes	3.4.2 (21)
0610$_H$ to 061F$_H$	1552 to 1567	Use prohibited	—	—	—	—	—
0620$_H$ to 0624$_H$	1568 to 1572	Model Name Display	"QJ71DN91" is set in ASCII code.	○	○	No	3.4.2 (22)
0625$_H$	1573	Node number	Displays the node number currently in operation.	○	○	No	3.4.2 (23)
0626$_H$	1574	Mode Switch Number	Displays the mode switch number currently in operation.	○	○	No	3.4.2 (24)
0627$_H$ to 062D$_H$	1575 to 1581	Use prohibited	—	—	—	—	—
062E$_H$	1582	H/W Test Item Display Area	Displays the item number of the hardware test being executed.	At the time of the hardware test		No	3.4.2 (25)
062F$_H$	1583	H/W Test Result Storing Area	Stores the result of the hardware test.	At the time of the hardware test		No	3.4.2 (26)
0630$_H$	1584	Parameter save area selection bit	Selects area to save to the flash ROM by the parameter-save request (Y17).	○	○	Yes	3.4.2 (27)
0631$_H$	1585	Auto communication start setting	Selects whether or not to start the I/O communication automatically at startup.	○	○	Yes	3.4.2 (28)
0632$_H$ to 06FF$_H$	1586 to 1791	Use prohibited	—	—	—	—	—
0700$_H$ to 07FF$_H$	1792 to 2047	Master Function Receive Data	Stores the data received from each slave node.	○	—	No	3.4.2 (29)
0800$_H$ to 08FF$_H$	2048 to 2303	Use prohibited	—	—	—	—	—
0900$_H$ to 09FF$_H$	2304 to 2559	Master Function Transmit Data	Stores the data to be sent to each slave node.	○	—	Yes	3.4.2 (30)
0A00$_H$ to 0AFF$_H$	2560 to 2815	Use prohibited	—	—	—	—	—
0B00$_H$ to 0B3F$_H$	2816 to 2879	Slave Function Receive Data	Stores the data received from the master node.	—	○	No	3.4.2 (31)
0B40$_H$ to 0BFF$_H$	2880 to 3071	Use prohibited	—	—	—	—	—
0C00$_H$ to 0C3F$_H$	3072 to 3135	Slave Function Transmit Data	Stores the data to be sent to the master node.	—	○	Yes	3.4.2 (32)
0C40$_H$ to 7FFF$_H$	3136 to 32767	Use prohibited	—	—	—	—	—

3.4.2 Buffer memory details

This section explains the details of the buffer memory.

(1) Message communication command (addresses 0110H to 011FH/272 to 287)

Use the TO instruction to write the message communication command.

(a) To get the attribute data of a slave node

1) Use the TO instruction to set the command data in the "message communication command" area.
2) Use the sequence program to turn ON the message communication request (Y12).
3) When the message communication is completed, the message communication completion (X02) is automatically turned ON.
4) Verify with the message communication error signal (X05) whether or not the message communication is normally completed.
5) Gotten attribute data is stored in the "message communication data" area.

The data to be set by the sequence program is listed in Table 3.4.

Table 3.4 Setting data for Get Attribute

Buffer memory address (hexadecimal)	Item	Description
0110H	Command number	0101H=Get Attribute
0111H	Slave node number (slave MAC ID), class ID	Lower byte: Node number of the slave node (MAC ID) Higher byte: Class ID of the object
0112H	Instance ID	Instance ID of the object
0113H	Attribute ID	Lower byte: Attribute ID of the object Higher byte: Always sets to 0.

(b) To set attribute data into the slave node

1) Use the TO instruction to set the command data in the "message communication command" area.
2) Use the TO instruction to set the attribute data to be set in the "message communication data" area.
3) Use the sequence program to turn ON the message communication request (Y12).
4) The message communication completion (X02) is automatically turned ON when message communication is completed.
5) Verify with the message communication error signal (X05) whether or nor the message communication is normally completed.

The data to be set by the sequence program is listed in Table 3.5.

Table 3.5 Setting data for Set Attribute

Buffer memory address (hexadecimal)	Item	Description
0110H	Command number	0102H=Set Attribute
0111H	Slave node number (slave MAC ID), class ID	Lower byte: Node number of the slave node (MAC ID) Higher byte: Class ID of the object
0112H	Instance ID	Instance ID of the object
0113H	Attribute ID	Lower byte: Attribute ID of the object Higher byte: Byte length of the attribute data to be set 1 to 240 (1H to F0H)

(c) To read the communication error information of the slave node

1) Use the TO instruction to set the command data in the "message communication command" area.
2) Use the sequence program to turn ON the message communication request (Y12).
3) The message communication completion (X02) is automatically turned ON when the message communication is completed.
4) Gotten attribute data is stored in the "message communication data" area.

The data to be set by the sequence program is listed in Table 3.6.

Table 3.6 Setting data for reading communication error information

Buffer memory address (hexadecimal)	Item	Description
0110H	Command number	0001H=Reads Communication Error Information
0111H	Slave node number (slave MAC ID)	Lower byte: Node number of the slave node (MAC ID) Higher byte: Always sets to 0.

(d) To reset

1) Use the TO instruction to set the command data in the "message communication command" area.
2) Use the TO instruction to set the attribute data to be set in the "message communication data" area.
3) Use the sequence program to turn ON the message communication request (Y12).
4) The message communication completion (X02) is automatically turned ON when the message communication is completed.
5) Verify with the message communication error signal (X05) whether the message communication is normally completed.

The data to be set by the sequence program is listed in Table 3.7.

Table 3.7 Setting data for Reset

Buffer memory address (hexadecimal)	Item	Description
0110H	Command number	0201H=Reset
0111H	Slave node number (slave MAC ID), class ID	Lower byte: Node number of the slave node (MAC ID) Higher byte: Class ID of the object
0112H	Instance ID	Instance ID of the object

(e) To execute other message communication

The following shows the setting data. For details, refer to the DeviceNet Common Service of the DeviceNet Specifications Manual (Release 2.0).

Table 3.8 Setting data for other message communication

Buffer memory address (hexadecimal)	Item	Description
0110H	Command number	FE＊＊H: Refer to DeviceNet Common Service for ＊＊.
0111H	Slave node number (slave MAC ID), class ID	Lower byte: Node number of the slave node (MAC ID) Higher byte: Class ID of the object
0112H	Instance ID	Instance ID of the object
0113H	Attribute ID, data length	Lower byte: Attribute ID of the object Higher byte: Byte length of the attribute data to be set 1 to 240 (1H to F0H)

(2) Message communication result (addresses 0120H to 012FH/288 to 303)

Once the processing by the "message communication command" is executed, the QJ71DN91 sets the processing result in the "message communication result" area and turns ON the message communication completion (X02).
The processing result is retrieved by the FROM instruction of the sequence program.
The processing result is stored as shown in the following table.
For details of the execution error code in the buffer memory address 0121H, see Section 9.2.2, "Execution Error Code of Message Communication."

Table 3.9 Result data of Get Attribute

Buffer memory address (hexadecimal)	Item	Description
0120H	Command number	0101H=Get Attribute
0121H	Execution error code	Normal completion: 0000H Failed: Execution error code
0122H	Slave node number (slave MAC ID), class ID	Lower byte: Node number of the slave node (MAC ID) Higher byte: Class ID of the object
0123H	Instance ID	Instance ID of the object
0124H	Attribute ID, data length	Lower byte: Attribute ID of the object Higher byte: Byte length of the gotten attribute data 1 to 240 (1H to F0H)

Table 3.10 Result data of Set Attribute

Buffer memory address (hexadecimal)	Item	Description
0120H	Command number	0102H=Set Attribute
0121H	Execution error code	Normal completion: 0000H Failed: Execution error code
0122H	Slave node number (slave MAC ID), class ID	Lower byte: Node number of the slave node (MAC ID) Higher byte: Class ID of the object
0123H	Instance ID	Instance ID of the object
0124H	Attribute ID	Lower byte: Attribute ID of the object Higher byte: Byte length of the attribute data (1 to 240)

Table 3.11 Result data of Read Communication Error Information

Buffer memory address (hexadecimal)	Item	Description
0120H	Command number	0001H=Reads Communication Error Information
0121H	Execution error code	Normal completion: 0000H Failed: Execution error code

Table 3.12 Setting data for Reset

Buffer memory address (hexadecimal)	Item	Description
0120H	Command number	0201H=Reset
0121H	Execution error code	Normal end: 0000H Failed: Execution error code
0122H	Slave node number (slave MAC ID), class ID	Lower byte: Node number of the slave node (MAC ID) Higher byte: Class ID of the object
0123H	Instance ID	Instance ID of the object

Table 3.13 Result data for other message communications

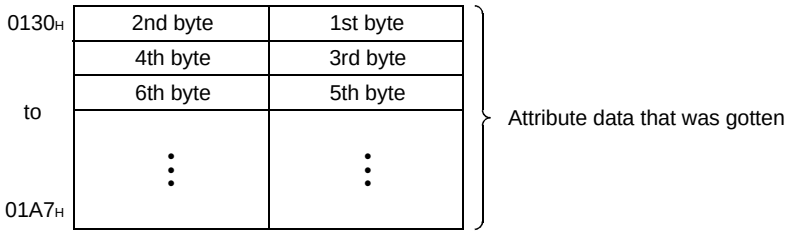
Buffer memory address (hexadecimal)	Item	Description
0120H	Command number	FE ＊ ＊H: Refer to DeviceNet Common Service for ＊ ＊.
0121H	Execution error code	Normal completion: 0000H Failed: Execution error code
0122H	Slave node number (slave MAC ID), class ID	Lower byte: Node number of the slave node (MAC ID) Higher byte: Class ID of the object
0123H	Instance ID	Instance ID of the object
0124H	Attribute ID, data length	Lower byte: Attribute ID of the object Higher byte: Byte length of the gotten attribute data 1 to 240 (1H to F0H)

(3) Message communication data (addresses 0130H to 01A7H /304 to 423)

The message communication data area is used for the following application:

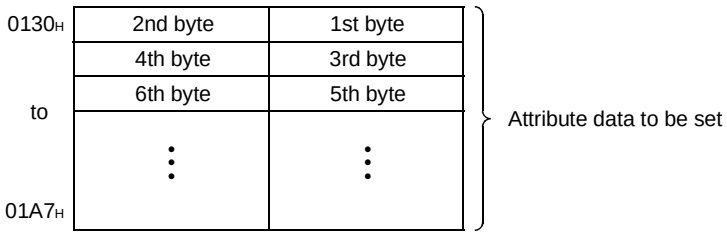
(a) Getting attribute data

The attribute data that was gotten via the message communication is stored as a byte string.



(b) Setting attribute data

Set the attribute data to be set via the message communication as a byte string.



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(c) Reading communication error information

The communication error information that was read is stored.

The data set in each address is shown in Table 3.14.

Table 3.14 Setting data for reading communication error information

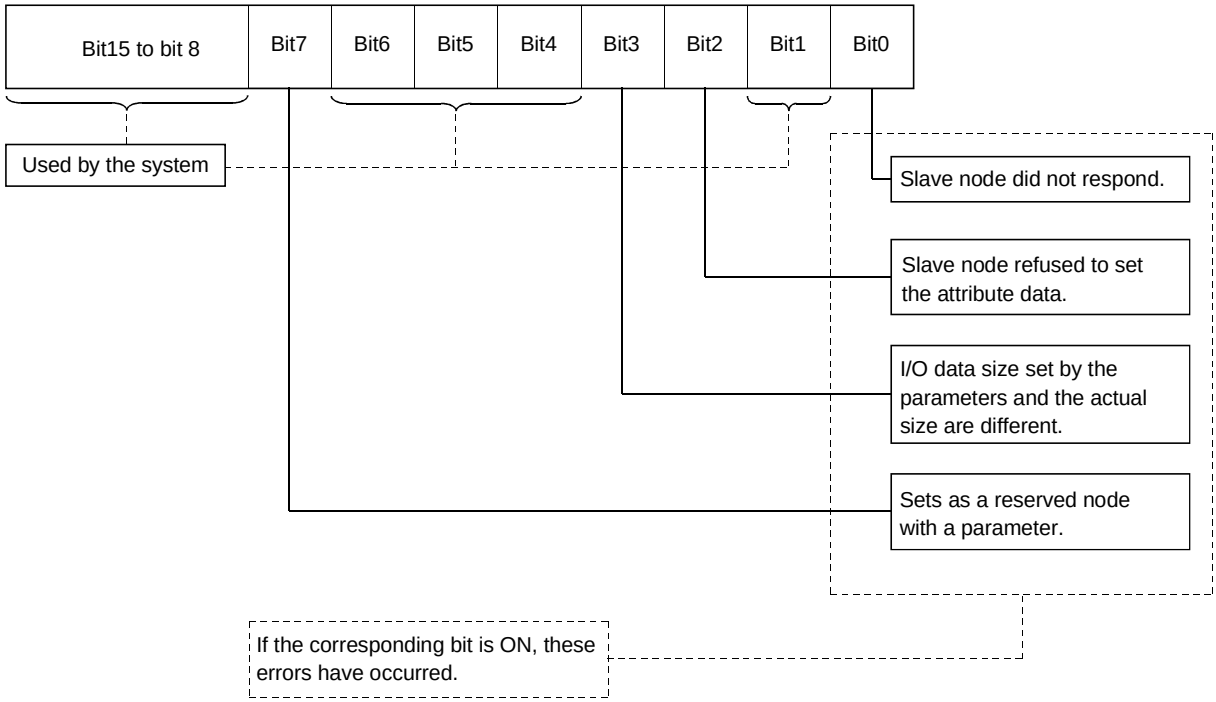
Buffer memory address (hexadecimal)	Item	Description
0130H	Slave status	Indicates whether or not the slave node is set in the parameters, and the slave node has responded, etc. (See 1).)
0131H	Use prohibited	—
0132H	Communication error	Stores the same error code as the higher byte of the buffer memory address 01B1H. See Section 9.2.1, "Communication error code."
0133H	DeviceNet general error code	Stores a DeviceNet general error code sent from the slave node. Valid only when the communication error code is 35(0023H). (See 2).) ＊1
0134H	Additional error code	Stores an additional error code sent from the slave node. ＊2
0135H	Heartbeat timeout count	Stores the number of times that detected the down status of each slave node by DN91.

＊1: Refer to the manual of each slave node for the contents and handling for the actual errors.

＊2: Refer to the manual of each slave node for the meaning of each error code.

1) Slave status

ON/OFF of each bit notifies the down status of the slave node, as shown in the following diagram:



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2) The DeviceNet general error code list is shown in Table 3.15.

Table 3.15 DeviceNet general error code list

Error code		Error name	Description
Hexadecimal	Decimal		
0000_H to 0001_H	0 to 1	Reserved	Reserved by DeviceNet
0002_H	2	Resource unavailable	Requested service could not be executed because there was no space in the required resource.
0003_H to 0007_H	3 to 7	Reserved	Reserved by DeviceNet
0008_H	8	Service not supported	Requested service is not supported. Or, the requested service is not defined by the specified object class/instance.
0009_H	9	Invalid attribute value	Requested service had an error in the attribute data.
$000A_H$	10	Reserved	Reserved by DeviceNet
$000B_H$	11	Already in requested mode/state	Specified object has already made a transition to the requested mode/status.
$000C_H$	12	Object state conflict	Specified object was not in the state that could execute the requested service.
$000D_H$	13	Reserved	Reserved by DeviceNet
$000E_H$	14	Attribute not settable	Requested setup service specified an unchangeable attribute.
$000F_H$	15	Privilege violation	Service requester did not have the access privilege.
0010_H	16	Device state conflict	Specified device was not in the state that could execute the requested service.
0011_H	17	Reply data too large	Response data length exceeded the data length that can be processed.
0012_H	8	Reserved	Reserved by DeviceNet
0013_H	19	Not enough data	Requested service did not provide sufficient data to execute processing.
0014_H	20	Attribute not supported	Requested service specified undefined attribute.
0015_H	21	Too much data	Requested service also included invalid data.
0016_H	22	Object does not exist	Requested service specified unimplemented object.
0017_H	23	Reserved	Reserved by DeviceNet
0018_H	24	No stored attribute data	Attribute data of this object had not been saved before this service was requested.
0019_H	25	Store operation failure	Attribute data of this object was not saved due to an error that occurred during the save operation.
$001A_H$ to $001E_H$	26 to 30	Reserved	Reserved by DeviceNet
$001F_H$	31	Vendor specific error	Vender-specific error occurred. Specific error that occurred is indicated in the "additional error code" area (0134_H) of the error response. This error code can be used only when the error codes listed in this table and the object class definitions do not apply to the corresponding error.
0020_H	32	Invalid parameter	Requested service had an error in the parameter. This code can be used only when the parameter satisfies neither the requirement by the DeviceNet specification nor the requirement defined by application object specifications.
0021_H to 0027_H	33 to 39	Future extensions	Reserved by DeviceNet
0028_H	40	Invalid Member ID	Member ID of the requested service specified the unimplemented class/instance/attribute.
0029_H	41	Member not settable	Requested setup service specified an unchangeable member.
$002A_H$ to $00CF_H$	42 to 207	Reserved	Reserved by DeviceNet
$00D0_H$ to $00FF_H$	208 to 255	Reserved for Object Class and service errors	This error code range is used to indicate errors specific to the object class. The code in this range can be used only when an error code listed in this table does not correctly explain the error that occurred. Using the "additional error code" area (0134_H), the "DeviceNet general error code" area (0133_H) can be explained in detail.

(d) Other message communication

Refer to the DeviceNet Specifications Manual (Release 2.0), Volumes 1 and 2, for other message communication.

(4) Master Function Communication Status (address 01B0H/432)

The higher and lower bytes indicate the following master communication status:

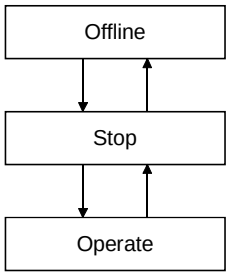
(a) Higher byte

This byte indicates the I/O communication status of the QJ71DN91 master function. The values in Table 3.16 are stored according to the communication status.

Table 3.16 I/O communication status

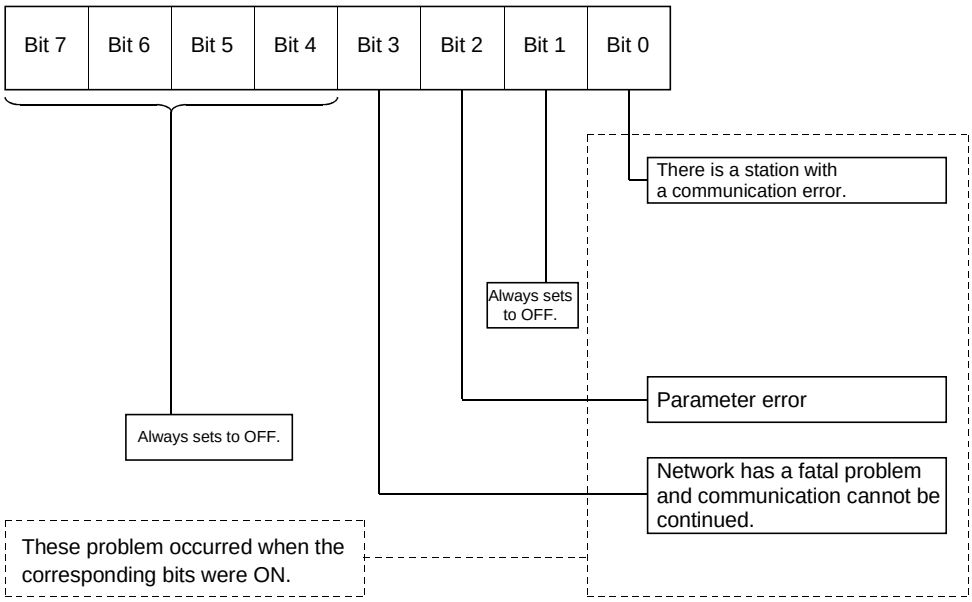
Value	Name	Operation
00H	Offline	Being initialized
40H	Stop	I/O communication being stopped
C0H	Operate	I/O communication in progress

When the power is turned ON, the status of the master function automatically changes from Offline to Stop if the auto communication start setting in the buffer memory address 0631H is 0. The status automatically makes transitions from Offline to Operate if the setting is 1.
If a reset message is received from the DeviceNet network, the status automatically returns to Offline and makes transitions from Offline to Operate.



(b) Lower byte

This byte indicates the network's communication status. Each bit is turned ON/OFF as follows, according to the communication status.



(5) Master Function For Error Information (address 01B1H/433)

The communication error code that was detected is stored.

(a) When an error occurs, the error information is stored in the "master function for error information" area, and the master function for error set signal (X03) is turned ON.

(b) The data in the " master function for error information " area is cleared by turning ON the master function for error reset request (Y13) by the sequence program.

(c) The error information is divided and stored in the higher byte and lower byte for the error code and the detected node number, respectively.

1) Higher byte
Stores the error code.
See Section 9.2.1, "Communication error code," for details.

2) Lower byte
Stores the node number (MAC ID) of the node where the error occurred.
FEH, FFH (254, 255): Local node (QJ71DN91)
0H to 3FH (0 to 63): Node number (MAC ID) of the slave node where the error occurred.

POINT

If errors occur at multiple nodes, the error of the node with the smallest node number (MAC ID) is stored.

(6) Bus Error Counter (address 01B2H/434)

The number of times that the illegal frame count of the CAN chip (DeviceNet's communication chip) exceeded 96 is stored. When this value is large, it indicates that communication is unstable.

(7) Bus Off Counter (address 01B3H/435)

The number of times that the QJ71DN91 makes a transition to the Bus-off status is stored. When this value is large, it indicates that communication is unstable.

(8) Each Node Configuration Status (addresses 01B4H to 01B7H/436 to 439)

When I/O Communication Request (Y11) turns ON and no errors are found as a result of parameter check, the status of parameter setting for each slave node is stored.

- When the corresponding bit is ON: Parameter has already been set.
- When the corresponding bit is OFF: Parameter has not been set.

Table 3.17 lists the buffer memory address and the node number corresponding to each bit.

Table 3.17 Corresponding node number of each bit with each node in configuration status

Buffer memory address	Corresponding node number of each bit				
(hexadecimal)	Bit 15	Bit 14	···	Bit 1	Bit 0
01B4H	Node 15	Node 14	···	Node 1	Node 0
01B5H	Node 31	Node 30	···	Node 17	Node 16
01B6H	Node 47	Node 46	···	Node 33	Node 32
01B7H	Node 63	Node 62	···	Node 49	Node 48

[Bit ON timing]

(a) When I/O communication is started

1) If automatic start has not been set
When I/O Communication Request (Y11) is turned ON, parameter check is made. When the parameter check succeeds, the corresponding bit of "Each Node Configuration Status" turns ON, and I/O Communicating (X01) then turns ON.

2) If automatic start has been set
When power is switched ON, parameter check is made automatically. When the parameter check succeeds, the corresponding bit of "Each Node Configuration Status" turns ON, and I/O Communicating (X01) then turns ON.

(b) When "Parameters for the master function" are saved to flash ROM
When Save Parameter To Flash ROM Request (Y17) is turned ON, parameter check is made. When the parameter check succeeds, the corresponding bit of "Each Node Configuration Status" turns ON, and Saving Parameter To The Flash ROM Completion (X06) and Save Parameter To The Flash ROM (X07) then turn ON.

[Bit OFF timing]

(c) When I/O communication is started after disconnection of the slave node registered to the "Parameters for the master function", when I/O communication is started after removal of the registration of the slave node registered to the "Parameters for the master function" at the time of saving the "Parameters for the master function" to the flash ROM, or when the "Parameters for the master function" are saved to the flash ROM, parameter check is made. When the parameter check succeeds, the corresponding bit turns OFF in "Each Node Configuration Status" of the slave node whose registration has been removed.

(d) When power of master station is switched from OFF to ON or PLC CPU is reset
When the power of the master station is switched from OFF to ON or the PLC CPU is reset, all bits of "Each Node Configuration Status" turn OFF.

(9) Each Node Communication Status (addresses 01BC$_H$ to 01BF$_H$/444 to 447)

These addresses store whether I/O communication being made to each slave node is normal or not when I/O Communicating (X01) is ON.
When I/O Communicating (X01) is OFF, all bits are OFF.

- When the corresponding bit is ON: Communication in progress
- When the corresponding bit is OFF: Communication is stopped.

Table 3.18 lists the buffer memory address and node number corresponding to each bit.

Table 3.18 Corresponding node number of each bit with each node in communication status

Buffer memory address	Corresponding node number of each bit				
(hexadecimal)	Bit 15	Bit 14	…	Bit 1	Bit 0
01BC$_H$	Node 15	Node 14	…	Node 1	Node 0
01BD$_H$	Node 31	Node 30	…	Node 17	Node 16
01BE$_H$	Node 47	Node 46	…	Node 33	Node 32
01BF$_H$	Node 63	Node 62	…	Node 49	Node 48

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(10) Each Node Communication Error Status (addresses 1C0H to 1C3H/448 to 451)

These addresses store whether an I/O communication error has occurred or not for each slave node set to the "parameters for the master function" when I/O Communicating (X01) is ON.

Note that the error is not detected for the node where "Down Node Detection Disable Status (addresses 01CCH to 01CFH/460 to 463)" has been set.

- When the corresponding bit is ON : Communication error exists.
- When the corresponding bit is OFF: Communication error does not exist.

Table 3.19 indicates the buffer memory addresses and the node number corresponding to each bit.

Table 3.19 Corresponding Node Number of Each Bit in Each Node Communication Error Status

Buffer memory address	Corresponding node number of each bit				
(hexadecimal)	Bit 15	Bit 14	···	Bit 1	Bit 0
01C0H	Node 15	Node 14	···	Node 1	Node 0
01C1H	Node 31	Node 30	···	Node 17	Node 16
01C2H	Node 47	Node 46	···	Node 33	Node 32
01C3H	Node 63	Node 62	···	Node 49	Node 48

POINT

When any of the bits in the "Each Node Communication Error Status" area turns ON, Slave Down Signal (X04) turns ON.

(11) Each Node Obstacle Status (addresses 01C4H to 01C7H/452 to 455)

These addresses store whether or not a communication problem had occurred in each slave node.

- When the corresponding bit is ON: Problem information exists.
- When the corresponding bit is OFF: No error information exists.

Use the following procedure to turn OFF the corresponding bit.

(a) Using the message communication area of the buffer memory, execute the readout of the communication error information of the corresponding node. (For information on the readout of communication error information, see Section 3.4.2, (1) message communication command, (2) message communication result, and (3) message communication data.)

(b) When the readout of communication error information is executed, the corresponding bit is automatically turned OFF.
Table 3.20 lists the buffer memory address and node number corresponding to each bit.

Table 3.20 Corresponding node number of each bit when each node is in obstacle status

Buffer memory address	Corresponding node number of each bit				
(hexadecimal)	Bit 15	Bit 14	···	Bit 1	Bit 0
01C4H	Node 15	Node 14	···	Node 1	Node 0
01C5H	Node 31	Node 30	···	Node 17	Node 16
01C6H	Node 47	Node 46	···	Node 33	Node 32
01C7H	Node 63	Node 62	···	Node 49	Node 48

(12) Down Node Detection Disable Status (addresses 01CC$_H$ to 01CF$_H$/460 to 463)

These addresses set whether or not the I/O signal, "slave down signal" (X04), reflects the down status of each slave node as indicated by the "each node communication status" (addresses 01BC$_H$ to 01BF$_H$/444 to 447).

• When the corresponding bit is ON: The slave down signal (X04) is not turned ON even if the corresponding slave node is down.

• When the corresponding bit is OFF: The slave down signal (X04) is turned ON when the corresponding slave node is down.

Table 3.21 lists the buffer memory address and node number corresponding to each bit.

Table 3.21 Corresponding node number of each bit for the down node detection disable status

Buffer memory address	Corresponding node number of each bit				
(hexadecimal)	Bit 15	Bit 14	···	Bit 1	Bit 0
01CC$_H$	Node 15	Node 14	···	Node 1	Node 0
01CD$_H$	Node 31	Node 30	···	Node 17	Node 16
01CE$_H$	Node 47	Node 46	···	Node 33	Node 32
01CF$_H$	Node 63	Node 62	···	Node 49	Node 48

POINT

For the node that is set as a reserved node by the parameter setting, turn ON the corresponding bit of the down node detection disable status. If it remains OFF, it is recognized as a down node even if it is a reserved node.

(13) Parameters for the master function (addresses 01D4$_H$ to 03CF$_H$/468 to 975)

These addresses are used to set parameters by the sequence program. The contents of the parameters are checked when the I/O communication request (Y11) is turned ON, and the communication starts if there is no error. Although the contents of the buffer memory are cleared when the power is turned OFF and at reset, the contents of the parameters saved in the flash ROM are stored in the parameters for the master function area if the flash ROM contains valid parameters. Turn ON the request to save parameters to the flash ROM (Y17) to save it in the flash ROM as necessary.

Table 3.22 lists the contents of parameter settings.

Table 3.22 Parameter setting data (1/2)

Buffer memory address (hexadecimal)	Item	Description
01D4H to 01D6H	Use prohibited	—
01D7H	Constant scan	Specifies to make the link scan time constant. (setting range: 0 to 65535 ms (FFFFH)) ✻
01D8H	Node number and message group of the 1st slave node	Lower byte: Node number of the 1st slave node (MAC ID) 00H to 3FH (0 to 63) Higher byte: Node that supports 01H → UCMM and uses message group 3 Node that supports 03h → UCMM and uses message group 1 Node that does not support 04H → UCMM (group 2 dedicated server) 80H → Reserved node
01D9H	Connection type of the 1st slave node	Selects the connection type of I/O communication. 0001H= Polling 0002H= Bit strobe 0004H= Change-of-state 0008H= Cyclic
01DAH	Byte module count of the 1st slave node	Lower byte: Input byte module count Higher byte: Output byte module count (For a bit module, eight points are calculated as one byte module, and is set in hexadecimal. Ex.: 0AH for 10 bytes)
01DBH	Word module count of the 1st slave node	Lower byte: Input word module count Higher byte: Output word module count (Sets in hexadecimal.)
01DCH	Double-word module count of the 1st slave node	Lower byte: Input double-word module count Higher byte: Output double-word module count (Sets in hexadecimal.)
01DDH	Expected packet rate of the 1st slave node	Sets the expected packet rate of the slave node. (Setting range: 0 to 65535 ms (FFFFH)) ✻ Setting value = 0000H (default value) → 200 ms Setting value ≠ 0000H → Setting value –1 is the expected packet rate (ms) The setting value varies depending on the connection type. See Table 3.23 for details of setting values.
01DEH	Watchdog timeout action of the 1st slave node	Operation during watchdog timeout at a slave node Setting value = 0000H: (default value) Same as the following timeout. Setting value = 0001H: Timeout The connection is placed in timeout state. It will not be recovered until an operator stops the communication and then resumes it. Setting value = 0002H: Auto Delete The connection is automatically deleted. At this time the communication stops once, then resumes automatically. The output is cleared once. Setting value = 0003H: Auto Reset The communication continues while connection is maintained. The output is not cleared.
01DFH	Production inhibit time of the 1st slave node	Sets the production inhibit time. (Setting range: 0 to 65535 ms (FFFFH)) ✻ Setting value = 0000H: (default value) → 10 ms Setting value ≠ 0000H → Setting value –1 is the minimum transmission interval (ms). The setting value varies depending on the connection type. See Table 3.23 for details of setting values.
01E0H to 01E7H	2nd node setting	Same as the 1st node
01E8H to 01EFH	3rd node setting	Same as the 1st node
01F0H to 01F7H	4th node setting	Same as the 1st node
01F8H to 01FFH	5th node setting	Same as the 1st node
0200H to 0207H	6th node setting	Same as the 1st node
0208H to 020FH	7th node setting	Same as the 1st node
0210H to 0217H	8th node setting	Same as the 1st node
0218H to 021FH	9th node setting	Same as the 1st node
0220H to 0227H	10th node setting	Same as the 1st node
0228H to 022FH	11th node setting	Same as the 1st node
0230H to 0237H	12th node setting	Same as the 1st node
0238H to 023FH	13th node setting	Same as the 1st node
0240H to 0247H	14th node setting	Same as the 1st node

✻ : When setting a value of 32768 or more, set it in hexadecimal.

Table 3.22 Parameter setting data (2/2)

Buffer memory address (hexadecimal)	Item	Description
0248H to 024FH	15th node setting	Same as the 1st node
0250H to 0157H	16th node setting	Same as the 1st node
0258H to 025FH	17th node setting	Same as the 1st node
0260H to 0267H	18th node setting	Same as the 1st node
0268H to 026FH	19th node setting	Same as the 1st node
0270H to 0277H	20th node setting	Same as the 1st node
0278H to 027FH	21st node setting	Same as the 1st node
0280H to 0287H	22nd node setting	Same as the 1st node
0288H to 028FH	23rd node setting	Same as the 1st node
0290H to 0297H	24th node setting	Same as the 1st node
0298H to 029FH	25th node setting	Same as the 1st node
02A0H to 02A7H	26th node setting	Same as the 1st node
02A8H to 02AFH	27th node setting	Same as the 1st node
02B0H to 02B7H	28th node setting	Same as the 1st node
02B8H to 02BFH	29th node setting	Same as the 1st node
02C0H to 02C7H	30th node setting	Same as the 1st node
02C8H to 02CFH	31st node setting	Same as the 1st node
02D0H to 02D7H	32nd node setting	Same as the 1st node
02D8H to 02DFH	33rd node setting	Same as the 1st node
02E0H to 02E7H	34th node setting	Same as the 1st node
02E8H to 02EFH	35th node setting	Same as the 1st node
02F0H to 02F7H	36th node setting	Same as the 1st node
02F8H to 02FFH	37th node setting	Same as the 1st node
0300H to 0307H	38th node setting	Same as the 1st node
0308H to 030FH	39th node setting	Same as the 1st node
0310H to 0317H	40th node setting	Same as the 1st node
0318H to 031FH	41st node setting	Same as the 1st node
0320H to 0327H	42nd node setting	Same as the 1st node
0328H to 032FH	43rd node setting	Same as the 1st node
0330H to 0337H	44th node setting	Same as the 1st node
0338H to 033FH	45th node setting	Same as the 1st node
0340H to 0347H	46th node setting	Same as the 1st node
0348H to 034FH	47th node setting	Same as the 1st node
0350H to 0357H	48th node setting	Same as the 1st node
0358H to 035FH	49th node setting	Same as the 1st node
0360H to 0367H	50th node setting	Same as the 1st node
0368H to 036FH	51st node setting	Same as the 1st node
0370H to 0377H	52nd node setting	Same as the 1st node
0378H to 037FH	53rd node setting	Same as the 1st node
0380H to 0387H	54th node setting	Same as the 1st node
0388H to 038FH	55th node setting	Same as the 1st node
0390H to 0397H	56th node setting	Same as the 1st node
0398H to 039FH	57th node setting	Same as the 1st node
03A0H to 03A7H	58th node setting	Same as the 1st node
03A8H to 03AFH	59th node setting	Same as the 1st node
03B0H to 03B7H	60th node setting	Same as the 1st node
03B8H to 03BFH	61st node setting	Same as the 1st node
03C0H to 03C7H	62nd node setting	Same as the 1st node
03C8H to 03CFH	63rd node setting	Same as the 1st node

POINT

(1) Write "0" in the unnecessary parameter area when creating a parameter. Otherwise, an error may occur if the previous data remains.

(2) Because of the limited number of writes of the flash ROM, execute the save parameter to flash ROM request (Y17) only when creating a new parameter or changing a parameter.

Table 3.23 Details of the expected packet rate and production inhibit time

	Expected packet rate	Production inhibit time
Polling	(1) Sets the communication watchdog timer value for the slave node. When the communication between the master node and the slave node stops for the duration represented by "value of this setting × 4," the slave node executes the operation specified by the Watchdog Timeout Action.	(1) Minimum transmission interval of the slave node = Sets the minimum time that the slave node can prepare the transmission data. The master node transmits the polling request to the slave node at this time interval or longer. ＊1
	(2) When the value of the expected packet rate setting is not equal to 1, i.e., when the expected packet rate is not equal to 0 ms, the expected packet rate must be equal to or greater than the production inhibit time.	
	(3) When the value of this setting = 1, i.e., when the expected packet rate = 0 ms, the watchdog timer monitor function is invalid.	(3) When the set value = 1, i.e. when the production inhibit time = 0 ms, the master node transmits the polling request to the slave node at intervals of the module scan.
Bit strobe ＊2	(1) Sets the communication watchdog timer value of the slave node. When the communication between the master node and the slave node stops for the duration represented by "value of this setting × 4," the slave node executes the operation specified by the Watchdog Timeout Action.	(1) Minimum transmission interval of the slave node = Sets the minimum time that the slave can prepare the transmission data. The master node transmits the bit strobe request to the slave node at this time interval or longer. ＊1
	(2) When the value of the expected packet rate setting is not equal to 1, i.e., when the expected packet rate is not equal to 0ms, the expected packet rate must be equal to or greater than the production inhibit time.	
	(3) When the value of this setting = 1, i.e., when the expected packet rate = 0 ms, the watchdog timer monitor function is invalid.	(3) When the set value = 1, i.e. when the production inhibit time = 0 ms, the master node transmits the bit strobe request to the slave node at intervals of the module scan.
Change-of-state	(1) Sets the communication watchdog timer value for the slave node. When the communication between the master node and the slave node stops for the duration represented by "value of this setting × 4," the slave node executes the operation specified by the Watchdog Timeout Action.	(1) Set the minimum time when the slave node can receive data. The master node transmits the output data to the slave node at this time interval. (The master node also transmits data to the slave node when the output data changes.) ＊1
	(2) When the value of the expected packet rate setting is not equal to 1, i.e., when the expected packet rate is not equal to 0 ms, the expected packet rate must be equal to or greater than the production inhibit time.	
	(3) When the set value = 1, i.e. the expected packet rate = 0 ms, the watchdog timer monitor function is invalid.	(3) When the set value = 1, i.e. when the production inhibit time = 0 ms, the master node transmits data to the slave node only when the output data changes.
Cyclic	(1) Specifies the interval of data transmissions from the slave node to the master node.	(1) Specifies the interval of data transmissions from the master node to the slave node. ＊1
	(2) When the value of the expected packet rate setting is not equal to 1, i.e., when the expected packet rate is not equal to 0 ms, the expected packet rate must be equal to or greater than the production inhibit time.	
	(3) When the setting value = 1, i.e., the expected packet rate = 0 ms, the setting is inhibited.	(3) When the setting value = 1, i.e., the production inhibit time = 0 ms, the setting is inhibited.

＊1: If the setting of the production inhibit time is shorter than the scan time of the module, the master node transmits data to the slave node at the intervals of the module scan.

＊2: The setting of the production inhibit time must be the same in all bit strobe connections.

(14) Auto configuration operation setting (address 03F0h/1008)

The auto configuration type and the maximum detection node numbers are set as follows:

1) Higher byte
   Sets the auto configuration type.
   00_H: All configuration
   01_H: Additional configuration
   (Default value: 00_H)
2) Lower byte
   Sets the maximum detection node number.
   00_H to $3F_H$ (0 to 63) (Default value: $3F_H$)

The following two auto configuration types are available:

- All configuration: Clears the "parameters for the master function" area, except for the constant scan, then searches all of the slave nodes on the network excluding the local node, from node 0 to the maximum detection node number, and stores the result in the "parameters for the master function" area.

- Additional configuration: Searches all of the slave nodes on the network, except for the local node and the slave nodes that have been already set, from node 0 to the maximum detection node number, then stores the result after the "parameters for the master function" area that has been already set. The area after the detected slave node is not cleared.

The auto configuration is performed in the following sequence. See Section 5.3, "Setting Using the Auto Configuration Function," for details.

(a) Set the auto configuration type in the "auto configuration operation settings" area.
(b) Set the auto configuration request (Y15) to ON.
(c) The auto configuration result is stored in the "parameters for the master function" area.

(15) Master Function For IO Address Area (addresses 0500H to 05FBH/1280 to 1531)

The head addresses and sizes (in word module) of the "input data for the master function" area and the "output data for the master function" area, which are used by each slave node, are stored.

This area can be used to check the head address of each node.

0500H	Input data head address of the 1st slave node
0501H	Input data size (word count) of the 1st slave node
0502H	Output data head address of the 1st slave node
0503H	Output data size (word count) of the 1st slave node
0504H	Input data head address of the 2nd slave node
	⋮
5FBH	Output data size (word count) of the 63rd slave node

(16) Present Link Scan Time (address 05FCH/1532)

The current link scan time (module: ms) is stored.

(17) Minimum Link Scan Time (address 05FDH/1533)

The minimum link scan time after the power in turned ON (module: ms) is stored.

(18) Maximum Link Scan Time (address 05FEH/1534)

The maximum link scan time after the power in turned ON (module: ms) is stored.

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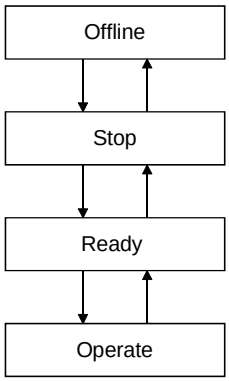
(19) Slave Function Communication Status (address 0600H/1536)

These addresses indicate the I/O communication status of the QJ71DN91 slave function. The values listed in Table 3.24 are stored according to the status of communication.

Table 3.24 I/O communication status of the slave function

Value	Name	Operation
0000H	Offline	Initialization in progress, bus-off, network power OFF
0040H	Stop	I/O communication being stopped
0080H	Ready	Waiting to establish the connection from the master node
00C0H	Operate	I/O communication in progress

When the power is turned ON, the status of the slave function automatically changes from Offline to Stop if the auto communication start setting in the buffer memory address 0631H is 0. The status automatically makes transitions from Offline to Operate if the setting is 1.
If a reset message is received from the DeviceNet network, the status automatically returns to Offline, then makes transitions from Offline to Operate. However, if the connection is not assigned from the master node, the status becomes Ready and cannot make a transition to Operate.



(20) Slave Function For Error Information (address 0601H/1537)

The communication error code when the slave function is used is stored.

(a) When an error occurs, the error information is stored in the "slave function for error information" area and the slave function for error set signal (X08) is turned ON.

(b) The data of the " slave function for error information " area is cleared by turning ON the slave function for error reset request (Y18) by the sequence program.

(c) See Section 9.2.1, "Communication error code," for details of the error information.

(21) Setting area of the number of slave function reception bytes (address 060EH/1550)/setting area of the number of slave function transmission bytes (address 060FH/1551)

The I/O data reception size and the I/O data transmission size of the slave function parameters are set. This area is used to set parameters by the sequence program. The contents of the parameters are checked when the I/O communication request (Y11) is turned ON, and the communication starts if there is no error. Although the contents of the buffer memory are cleared when the power is turned OFF and at reset, the contents of the parameters saved in the flash ROM are stored in the setting area of the number of slave function reception bytes and in the setting area of the number of slave function transmission bytes, if the flash ROM contains valid parameters. Turn ON the save parameter to flash ROM request (Y17) to save in the flash ROM as necessary.

Table 3.25 lists the contents of parameter settings.

Table 3.25 Parameter setting data for the slave function

Buffer memory address (hexadecimal)	Item	Description
060EH	Setting area of the number of slave function reception bytes	Sets the I/O data reception size of parameter for slave function. (Setting range: 0 to 128 bytes, default value: 8 bytes)
060FH	Setting area of the number of slave function transmission bytes	Sets the I/O data transmission size of parameter for slave function. (Setting range: 0 to 128 bytes, default value: 8 bytes)

POINT

Because of the limited number of writes of the flash ROM, execute the save parameter to flash ROM request (Y17) only when creating a new parameter or changing a parameter.

(22) Model Name Display (addresses 0620H to 0624H /1568 to 1572)

"QJ71DN91" is stored in ASCII code.

0620H	"J"	"Q"
0621H	"1"	"7"
0622H	"N"	"D"
0623H	"1"	"9"
0624H	"0"	"0"

(23) Node Number (address 0625H/1573)

The node number currently in operation is stored.

00H to 3FH (Stores in binary code.)

(24) Mode Switch Number (address 0626H/1574)

The mode switch number currently in operation is stored.

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(25) H/W Test Item Display Area (address 062EH/1582)

The test item numbers currently in operation during the hardware test and communication test are stored.

Table 3.26 Contents of the hardware test item display

Test item number	Contents	Processing
0000H	Before test starts	Before the hardware test starts
0001H	ROM check	Testing if the ROM is normal
0002H	RAM check	Testing if the RAM is normal
0003H	Microcomputer check	Testing if the Microcomputer is normal
0004H	CAN controller check	Testing if the CAN controller is normal
FFFFH	Test completed normally	Hardware test was executed and completed normally

Table 3.27 Contents of communication test item display

Test item number	Contents	Processing
0000H	Before test starts	Before the communication test starts
0001H	Node number duplicate check	Checking if there is another node with the same node number as that of the local node
0002H	Communication check	Checking if communication with one or more nodes in the network is available
FFFFH	Test completed normally	Communication test was executed and completed normally

(26) H/W Test Result Storing Area (address 062FH/1583)

The results of the hardware test and communication test are stored.

Table 3.28 Contents of hardware test result

Error code	Contents	Error handling
0000H	No error	Hardware test was completed normally.
60AAH	RAM error	This is a hardware error. Report the error symptoms to the nearest service center, dealer or branch office.
61AAH	ROM error	
62AAH	CAN controller check error	
63AAH	Network power supply error	Verify that power is supplied to the network.
70AAH	Microcomputer error	This is a hardware error. Report the error symptoms to the nearest service center, dealer or branch office.
71AAH		
72AAH		
73AAH		
74AAH		

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Table 3.29 Contents of communication test result

Error code	Contents	Detailed contents	Handling method
0001H	Node number duplicate error	There is another node in the network which has the same node number as the local node.	• Assign different node numbers to all nodes in the network.
0002H	Bus off error	A bus off occurred during the test.	• Set the communication speed of all nodes in the network to the same value. • Check the overall network conditions, including if the terminal resistor is disconnected, if the length of the communication cable is correct, etc.
0003H	Network power supply error	The network power supply is turned OFF.	• Turn ON the network power supply.
0004H 0005H	Communication error	The data could not be sent or received correctly.	• Connect one or more nodes in the network. • Set the communication speed of all nodes in the network to the same value. • Check the overall network conditions including if the terminal resistor is disconnected, if the length of the communication cable is correct, etc.
0006H	No error	Communication test was completed normally.	—

(27) Parameter save area selection bit (address 0630H/1584)

This bit selects which parameter is to be saved when the save parameter to flash ROM request (Y17) is turned ON from OFF.

To clear the parameters of the flash ROM, set 8000H.

In this case, the parameters of the buffer memory are not cleared.

The default value varies depending on the operating mode. See Table 3.30.

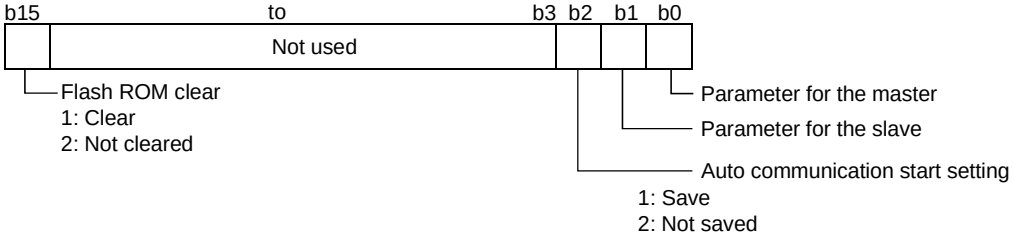

Table 3.30 Default value of the parameter save area bit

Mode	Default value
0 to 2 (master function only)	0005H
3 to 5 (slave function only)	0006H
6 to 8 (master function and slave function)	0007H

(28) Auto communication start setting (address 0631H/1585)

This setting is used to set whether or not the I/O communication automatically starts when the power is turned ON or at reset by the parameter saved in the flash ROM.

0: I/O communication does not start automatically (default value).

1: I/O communication starts automatically.

∗: The I/O communication does not start automatically when any value other than 0 or 1 is set.

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(29) Master Function Receive Data (addresses 0700H to 07FFH/1792 to 2047)

The data that was received from each slave node is stored. The data assignment is shown below. The data is stored in the word boundaries of the slave nodes. Double-word data is stored in the order of lower word first and higher word next. If there is an odd number of byte input modules, one byte of empty area will be inserted for alignment at the word boundary. Bit input modules are treated in the same way as the byte input modules.

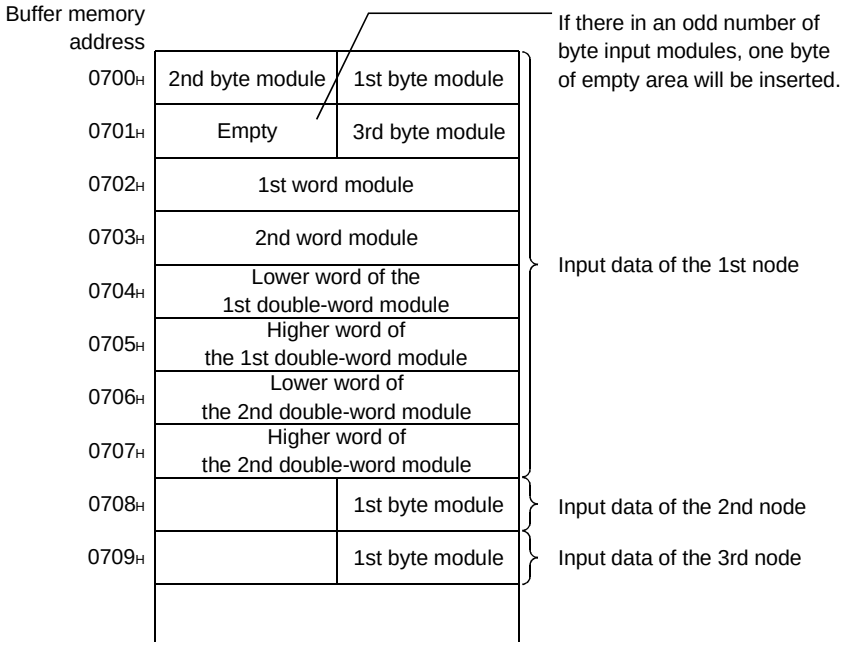
The following shows an example:

<Example>

1st node - Number of byte input modules = 3
Number of word input modules = 3
Number of double-word input modules = 2

2nd node - Number of byte input modules = 1

3rd node - Number of byte input modules = 1



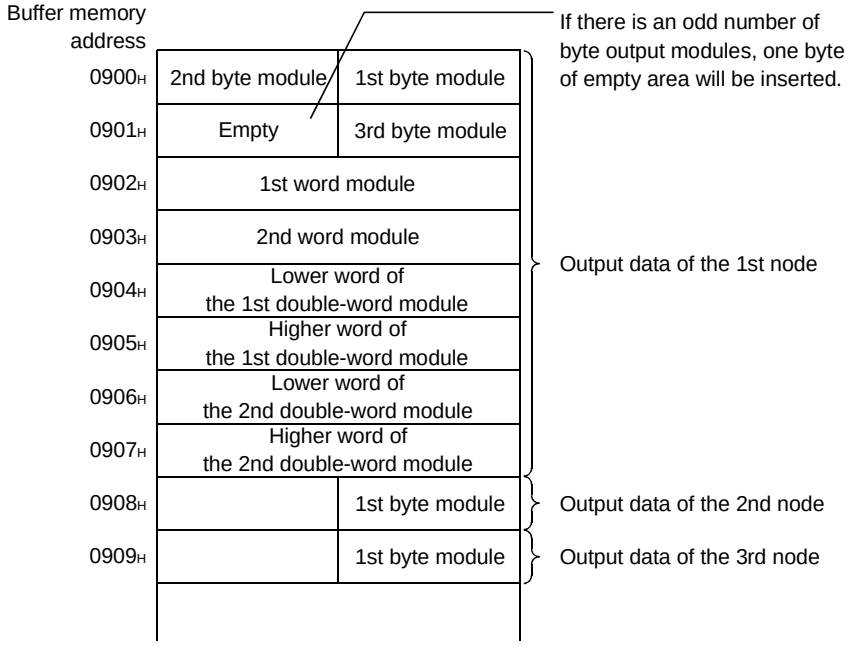
Word input module:	Numeric data represented by bit 9 to 16
Double-word input module:	Numeric data represented by bit 17 to 32
Byte input module:	Data represented by ON/OFF, or numeric data represented by bit 1 to 8

(30) Master Function Transmit Data (addresses 0900H to 09FFH /2304 to 2559)

The data to be transmitted to each slave node is written by the TO instruction.
The data assignment is shown below.
The data is stored in the word boundaries of the slave nodes. Double-word data is stored in the order of lower word first and higher word next. If there is an odd number of byte input modules, one byte of empty area will be inserted for alignment at the word boundary.
The following shows an example.

<Example>

1st node - Number of byte output modules = 3
Number of word output modules = 2
Number of double-word output modules = 2
2nd node - Number of byte output modules = 1
3rd node - Number of byte output modules = 1



3 - 48

(31) Slave Function Receive Data (addresses 0B00H to 0B3FH/2816 to 2879)

The data received from the master node is stored. The data of the size that is set by the "setting area of the number of slave function reception bytes" becomes valid.

0B00H	2nd byte	1st byte
0B01H	4th byte	3rd byte
0B02H	6th byte	5th byte
	⋮	⋮

(32) Slave Function Transmit Data (addresses 0C00H to 0B3FH/3072 to 3135)

The data to be transmitted to the master node is written by the TO instruction. The I/O data of the size, which is set by the "setting area of the number of slave function transmission bytes," is sent.

0C00H	2nd byte	1st byte
0C01H	4th byte	3rd byte
0C02H	6th byte	5th byte
	⋮	⋮

POINT

When the QJ71DN91 is used as the master node, set an even number of byte modules. If an odd number of byte modules is set and word modules and double-word modules are set at the same time, the word data and double-word data cannot be sent and received normally.

3 - 49

3.5 Communication Performance

3.5.1 Scan time

The scan time represents the time to wait for responses from all nodes after the QJ71DN91 starts sending requests in the polling or bit strobe communication. The scan time can be calculated using the following expression:

Scan time LS = Σ (TIn + TOn + 0.097) + 0.222 × BR + 0.1 (module: ms)

TIn: Transmission time of the reception data from the nth slave. (See the following expression for details.)
TOn: Transmission time of the transmission data from the nth slave. (See the following expression for details.)
Σ : Indicates adding values in ( ) of all slave nodes (except for the reserved nodes).
BR: Coefficient corresponding to the baud rate
500kbaud = 1, 250kbaud = 2, 125kbaud = 4

(1) How to calculate TIn

1) When the length of reception data from the nth slave is 8 bytes or less
: TIn=BT + BTa × reception data length (bytes)
2) When the length of reception data from the nth slave is 9 bytes or more
: TIn=(BT + BTa × 8 + 0.190) × a + {BT + BTa × (b+1) + 0.450}
whereas, a = reception data length divided by 7 (round down below decimal point)
b = remainder of reception data length divided by 7

(2) How to calculate TOn

1) When the length of transmission data to the nth slave is 8 bytes or less
: TOn=BT + BTa × transmission data length (bytes)
2) When the length of transmission data from the nth slave is 9 bytes or more
: TOn=(BT + BTa × 8 + 0.130) × c + {BT + BTa × (d+1) + 1.000}
whereas, c = transmission data length divided by 7 (round down below decimal point)
d = remainder of transmission data length divided by 7

	125 kbaud	250 kbaud	500 kbaud
BT	0.376	0.188	0.094
BTa	0.064	0.032	0.016

3.5.2 Communication cycle

The communication cycle is the time interval between the moment a polling or a bit strobe request is sent to a slave node and the moment another request is sent to the same node. A different communication cycle can be set for each node by setting the production inhibit time parameter.
The communication cycle for each slave node can be calculated using the following expression:

Communication cycle LC = LS + production inhibit time (module: ms)

3.5.3 Transmission delays

(1) Input transmission delay

The input transmission delay can be calculated using the following expressions:

	When the reception data is read by the sequence program	When auto refresh is used
Maximum value	LS × 2 + Sequence scan time	
Normal value	LS + Sequence scan time x 0.5	

(module: ms)

(2) Output transmission delay

The output transmission delay can be calculated using the following expressions:

	When the transmission data is sent by the sequence program	When auto refresh is used
Maximum value	LS × 2	LS × 2 + Sequence scan time
Normal value	LS	LS + Sequence scan time × 0.5

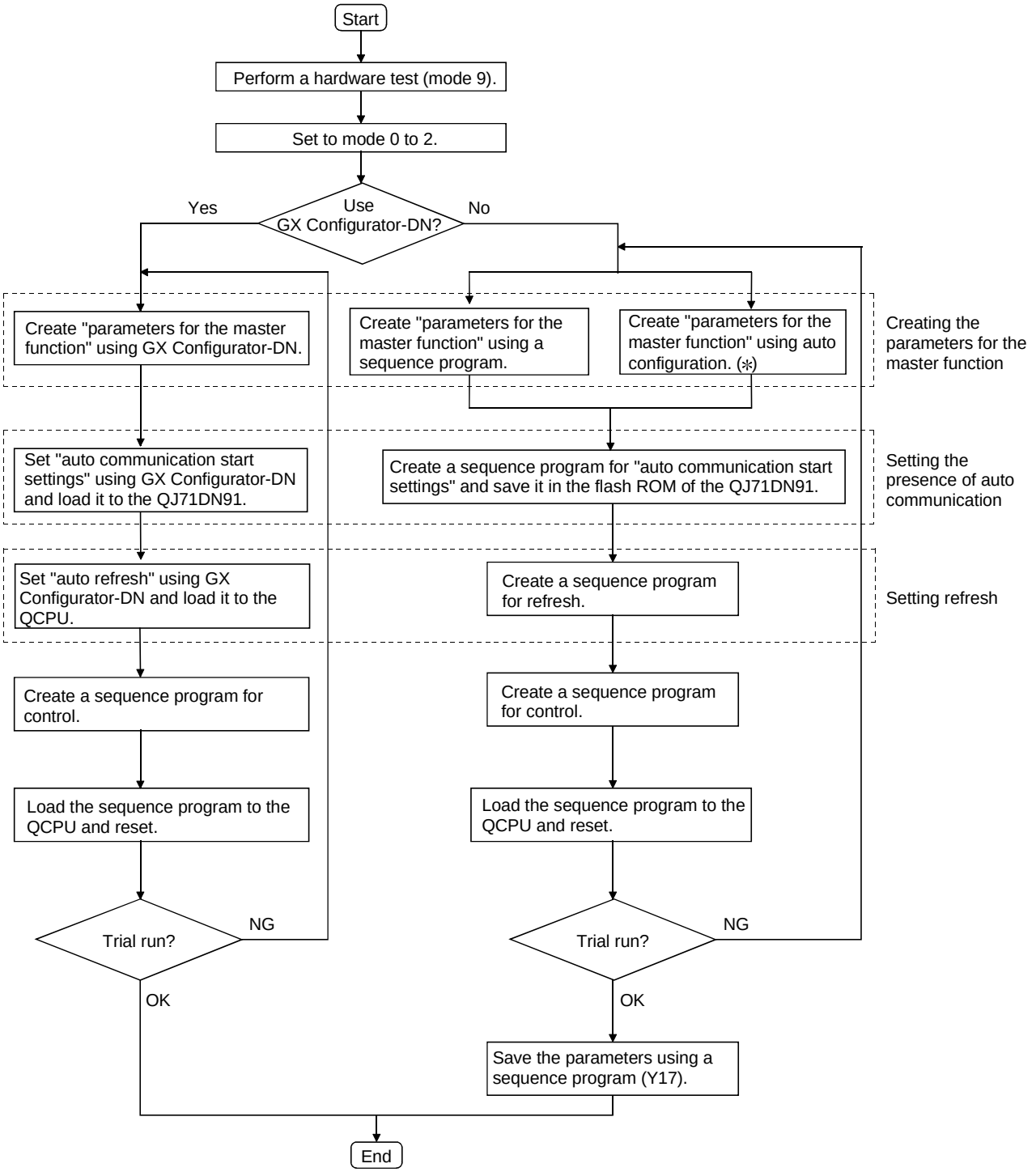
(module: ms)

4 SETUP AND PROCEDURES BEFORE OPERATION

This chapter describes the procedures up to system startup using the QJ71DN91.

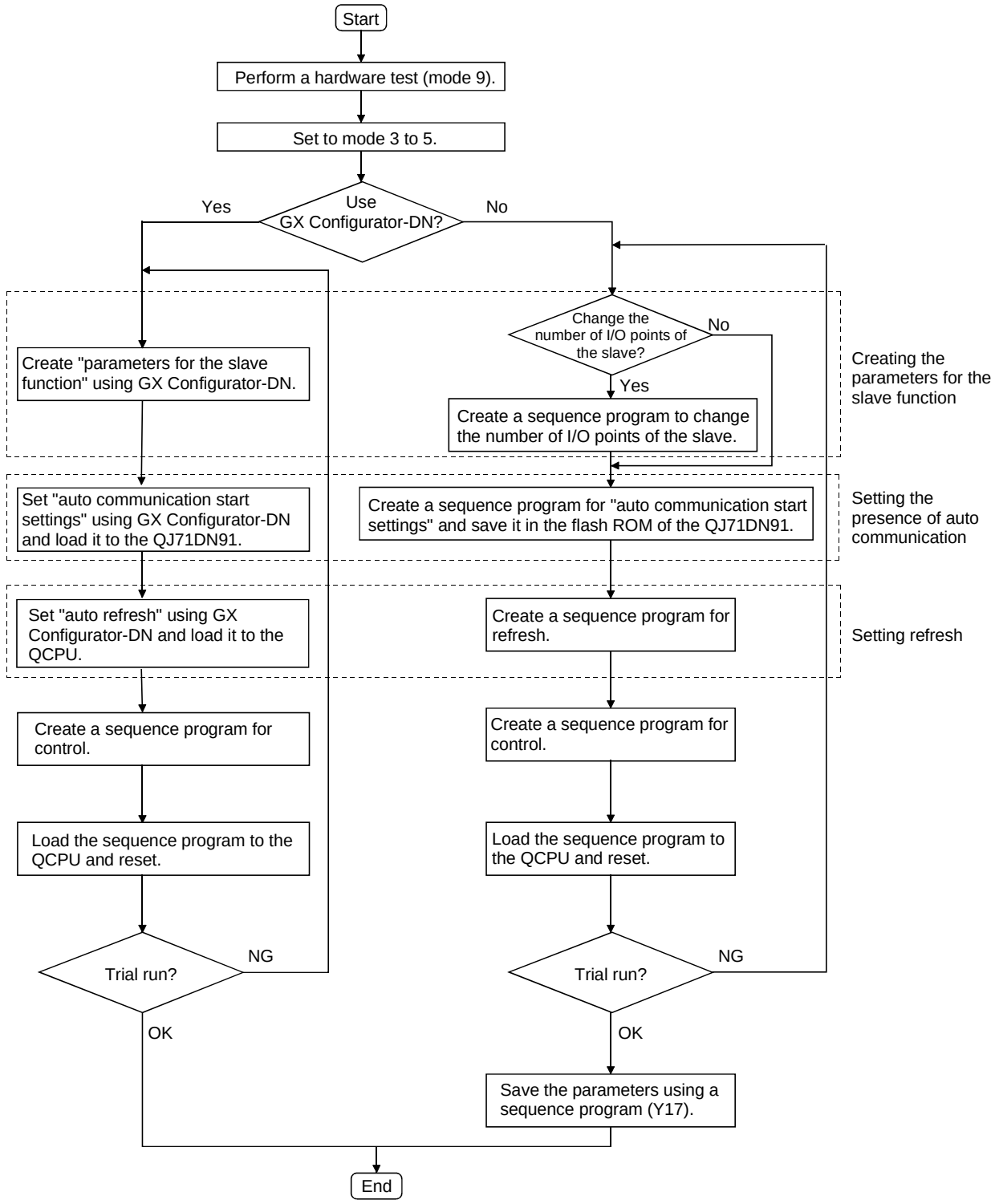
4.1 Setup and Procedures before Operation

4.1.1 When using the master function

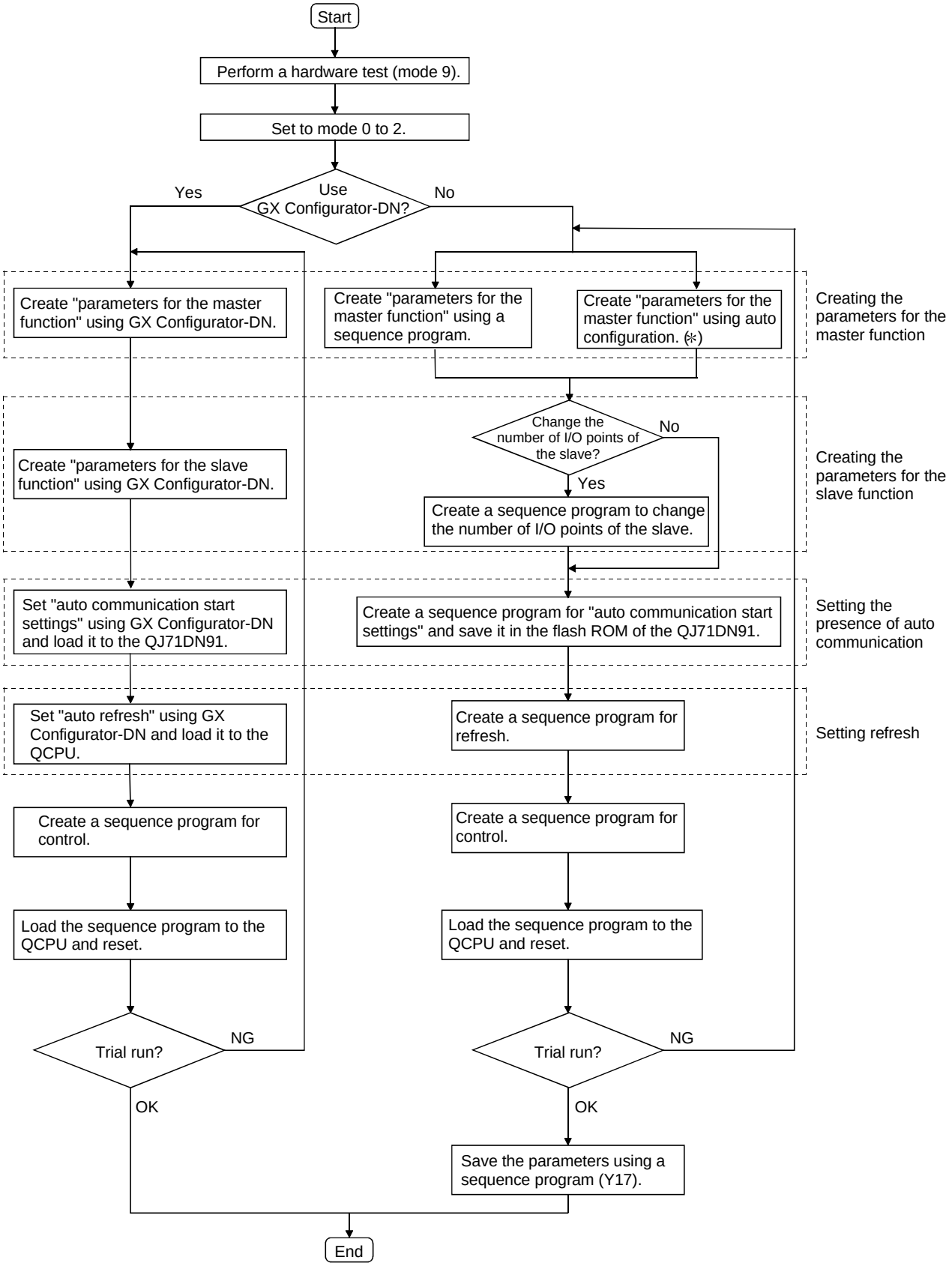


*: It is necessary to install a DeviceNet network and turn ON the power in advance.

4.1.2 When using the slave function



4.1.3 When using both the master function and slave function



*: It is necessary to install a DeviceNet network and turn ON the power in advance.

4.2 Loading and Installation

The following section explains the precautions when handling the QJ71DN91 from the time they are unpacked until they are installed.
For more details on the loading and installation of the module, refer to the User's Manual for the PLC CPU used.

4.2.1 Handling precautions

(1) Do not drop the module casing or connector, or do not subject it to strong impact.

(2) Do not remove the printed-circuit board of each module from its case. This may cause a failure in the module.

(3) Be careful not to let foreign objects such as wire chips get inside the module. These may cause fire, breakdown or malfunction.

(4) The top surface of the module is covered with a protective film to prevent foreign objects such as wire chips from entering the module during wiring. Do not remove this film until the wiring is complete.
Before operating the system, be sure to remove the film to provide adequate heat ventilation.

(5) Tighten the mounting screws using the torque within the range listed below. If the screws are not tightened securely, it may cause short-circuit, breakdown or malfunction.

Screw location	Clamping torque range
Module mounting screws (M3 screws)	36 to 48 N•cm
DeviceNet connector mounting screws	35.3 to 48.0 N•cm
DeviceNet connector wiring mounting screws	60.8 to 82.3 N•cm

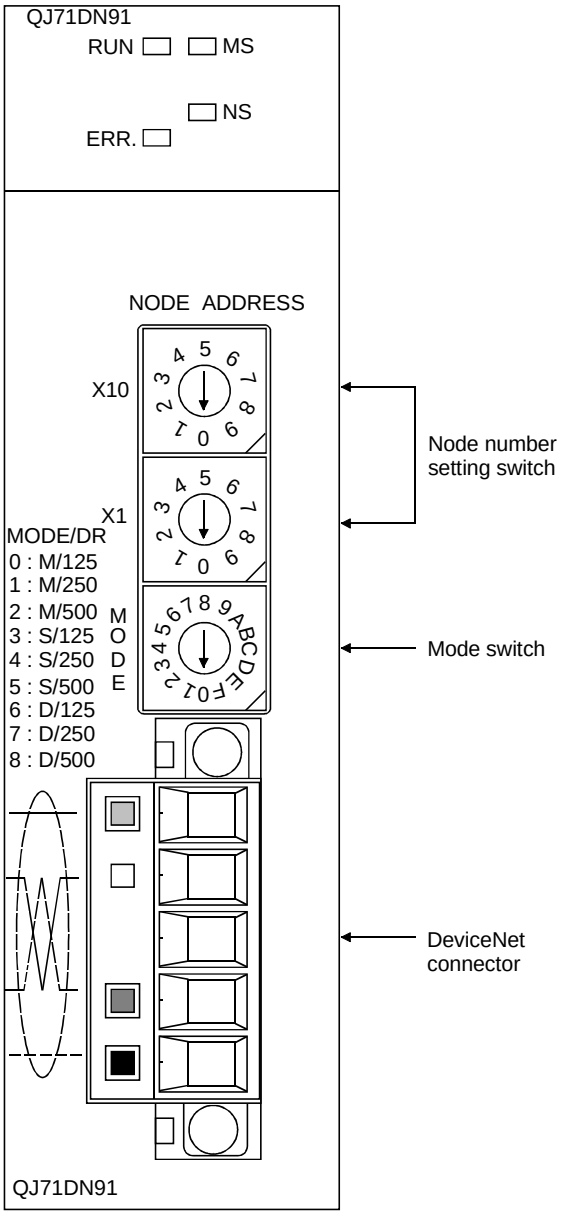
(6) To mount the module on the base unit, securely insert the module mounting latches into the mounting holes on the base unit. Improper installation may result in a malfunction or breakdown of the module, or may cause the module to fall off.

4.2.2 Installation environment

For more details on the installation environment, refer to the User's Manual for the PLC CPU module used.

4.3 Component Names and Settings

The following section describes the component names of the QJ71DN91, the meanings of the LED displays, and the setting procedure of the switches.



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4.3.1 Meanings of the LED displays

The following explains the names and meanings of the LEDs located on the top surface of the QJ71DN91 when the mode is set to 0 to 8.
For the meanings of the LEDs when the mode is set to 9 to C, see Section 4.4, "Hardware Test" or Section 4.6, "Communication Test".

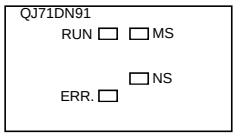


Table 4.1 LED names and meanings of LED displays

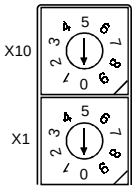
LED name	Color	LED display status
RUN	Green	On: In normal operation
		Off: Watchdog timer error
ERR.	Red	On: Node number setting error
		Flashing: The node number setting switch or mode setting switch was changed during module operation.
MS	Green	On: Communication is enabled.
		Flashing: parameter error
NS	Green	On: Communication in progress
		Flashing: Waiting for communication (waiting for an I/O communication request from the PLC CPU, or waiting for communication startup of the opposite device)
	Red	On: The node number is duplicate with the node number of other node. Bus off error (communication line error)
		Flashing: <For master> A node that does not respond exists. <For slave> Communication with the master node is interrupted.
	Green/red	Off: Power to the network is not being supplied.

4 - 6

4.3.2 Node number setting switch

The following explains the node number setting switch of the QJ71DN91.

Table 4.2 Description of the node number setting switch



Name	Description
Node number setting switch	Sets the node number of the module. (Setting at the time of shipment from the factory: 0) Since the node number is recognized when the module is powered on or reset, do not change the node number during module operation. If changed, the "ERR" LED will flash. Setting range: 0 to 63 (if a number other than 0 to 63 is set, the "ERR" LED will be lit.) * Exercise caution so that the node number does not duplicate with that of other node.

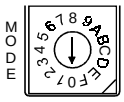
POINT

If the module is used as both the master and slave nodes, the same node number is used for the master and slave nodes.
Although the node number can be set between 0 and 63, smaller node numbers have higher communication priority as a communication characteristic of a DeviceNet network. Thus, set the smallest node number for the master node as much as possible.

4.3.3 Mode switch

The following explains the mode switch of the QJ71DN91.

Table 4.3 Description of the mode switch



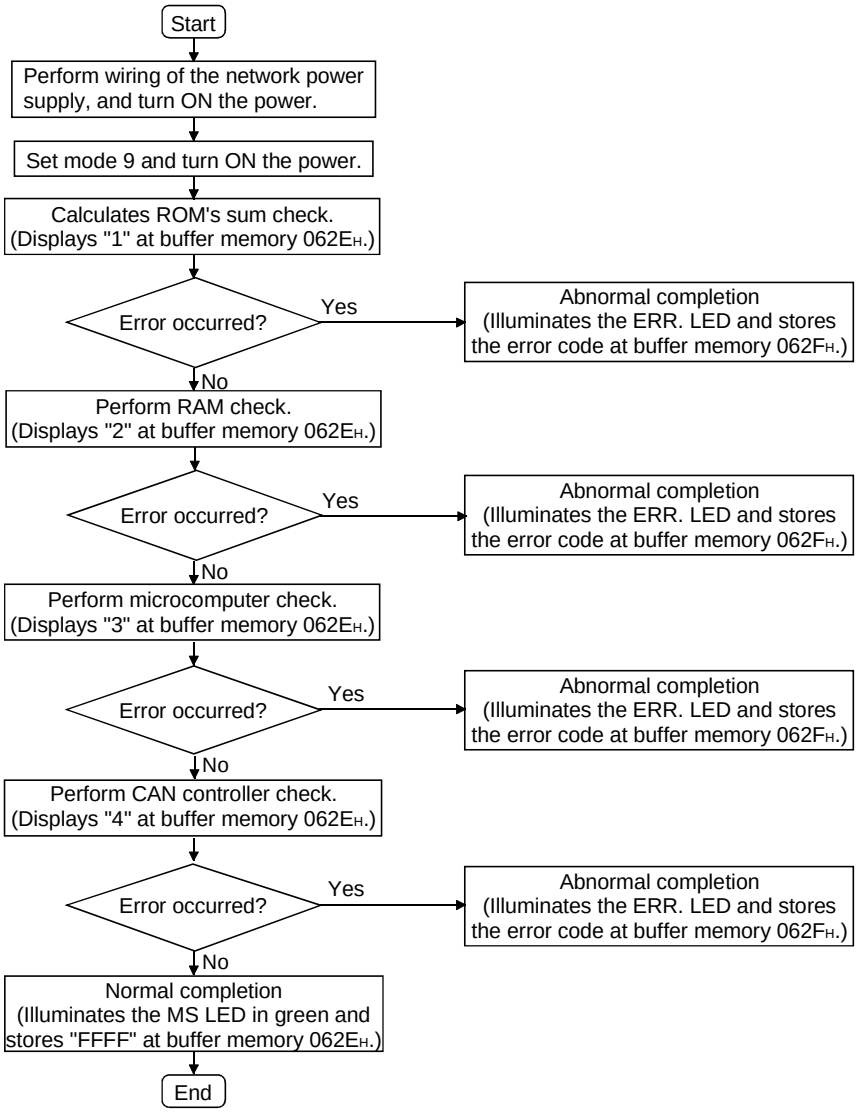
Name	Setting	Function	Description
Mode switch	0	Master function	Operates as the master node, communication speed 125k baud (setting at the time of factory shipment).
	1		Operates as the master node, communication speed 250k baud.
	2		Operates as the master node, communication speed 500k baud.
	3	Slave function	Operates as the slave node, communication speed 125k baud.
	4		Operates as the slave node, communication speed 250k baud.
	5		Operates as the slave node, communication speed 500k baud.
	6	Master and slave functions *	Operates as both the master node and slave node, communication speed 125k baud.
	7		Operates as both the master node and slave node, communication speed 250k baud.
	8		Operates as both the master node and slave node, communication speed 500k baud.
	9	Hardware test	Performs the ROM/RAM check and self-loop test.
	A	Communication test	Performs the transmission and reception test, communication speed 125k baud.
	B		Performs the transmission and reception test, communication speed 250k baud.
	C		Performs the transmission and reception test, communication speed 500k baud.
	D to F	Use prohibited	

* Select a mode between 6 and 8 when both the master function and slave function are used.

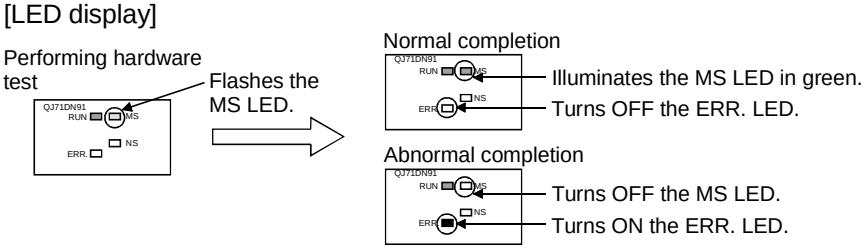
4.4 Hardware Test

The hardware test checks whether or not the standalone module operates normally. It performs a ROM check, RAM check, self-loop test, etc.
Be sure to perform the hardware test before configuring a system.
For more details on the test related to DeviceNet communication, perform a test by referring to Section 4.6, "Communication Test" after wiring is complete.

Execute the hardware test in the following sequence:



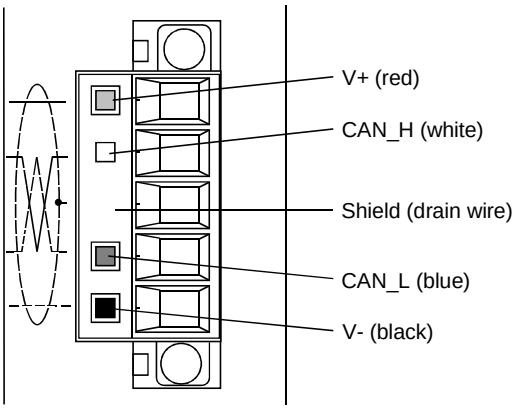
[LED display]



4.5 Connecting the Communication Cables to the QJ71DN91

(1) Connecting the communication cables

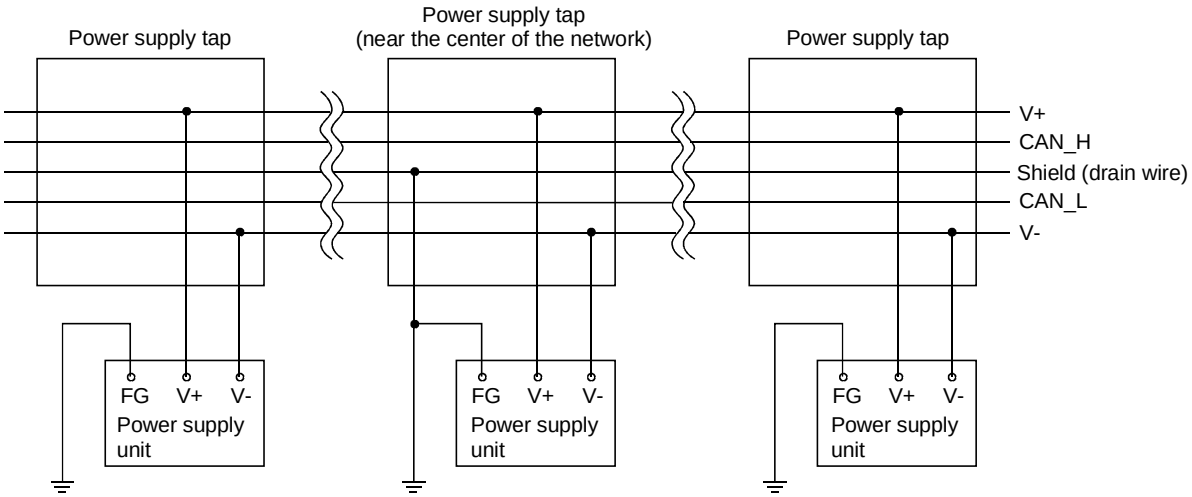
The following explains the connection method of the communication cables to the QJ71DN91.



The figure above shows the QJ71DN91's DeviceNet connectors. A sticker in the corresponding cable color is pasted on each connector.
Connect the communication cables by making sure that the colors of the connector and cable match.

(2) Grounding the network

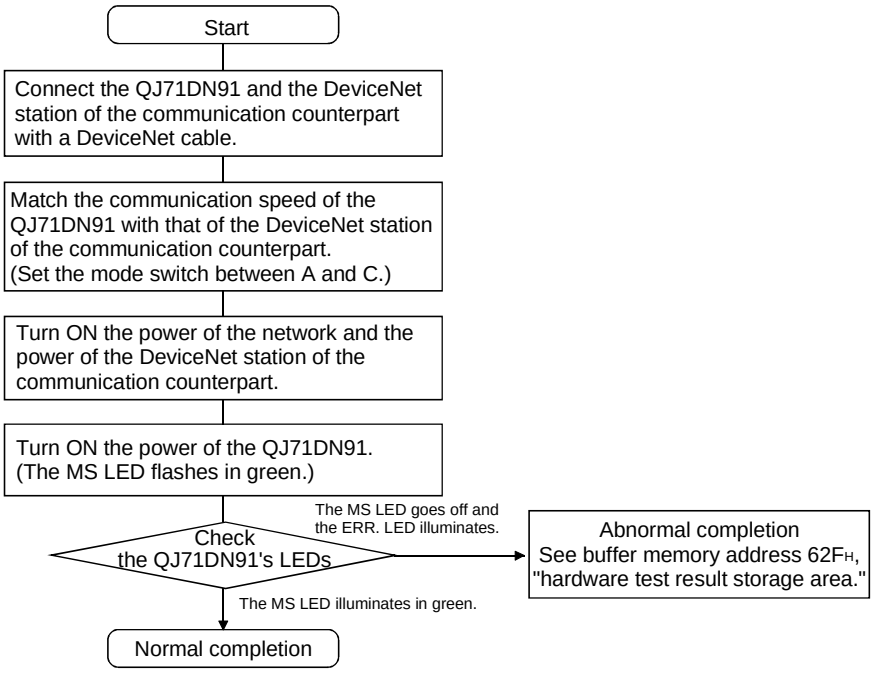
The DeviceNet network should be grounded at a single point, near the center of the network.
Connect the cable shield (drain wire) to the ground of the power supply unit, and perform Class D grounding (Class 3 grounding).
If multiple power supply units exist in a network, ground only the power supply unit near the center of the network, and do not ground others.
Also, if multiple power supply units are used, use a power supply tap for each power supply unit.



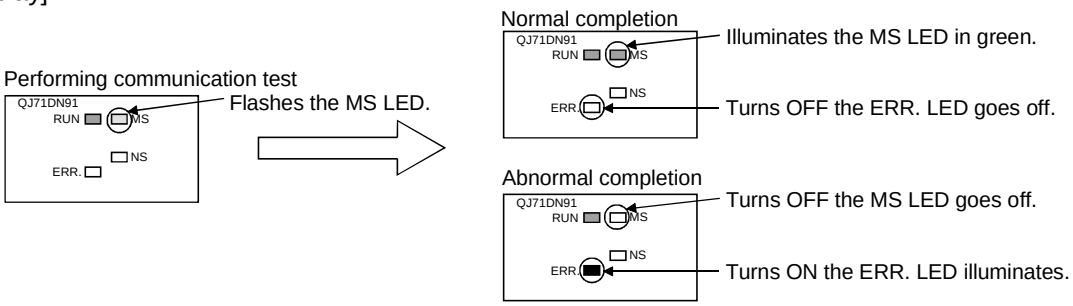
4.6 Communication Test

The transmission test and reception test are performed by connecting the QJ71DN91 and other DeviceNet devices with a communication cable. There is no restriction on the node number setting of the communication counterpart.

Execute the test in the following sequence:



[LED display]



4.7 Instructions for Connecting the Network Power Supply

This section explains the instructions for connecting the network power supply.

4.7.1 Network power supply unit installation position

Follow the procedure below to determine the position to install the network power supply unit.

1) Calculate the current consumption of the nodes required on the network.
2) Measure the total length of the network.
3) Refer to Tables 4.4 and 4.5 to determine the maximum current capacity corresponding to the network length and type of cable used.
4) If the current value calculated at step 1) is less than the current value calculated at step 3), any of the network power supply unit installation positions explained in the next page can be used.
5) If the current value calculated at step 1) exceeds the current value calculated at step 3), refer to the next page to determine whether the network power to all nodes.
6) If the results from step 5) indicate that power cannot be supplied to all nodes, increase the number of network power supply units.

Table 4.4 Maximum current capacity corresponding to the network length of thick cable

Network length (m)	0	25	50	100	150	200	250	300	350	400	450	500
Maximum current (A)	8.00	8.00	5.42	2.93	2.01	1.53	1.23	1.03	0.89	0.78	0.69	0.63

Table 4.5 Maximum current capacity corresponding to the network length of thin cable

Network length (m)	0	10	20	30	40	50	60	70	80	90	100
Maximum current (A)	3.00	3.00	3.00	2.06	1.57	1.26	1.06	0.91	0.80	0.71	0.64

POINT

Use a network power supply unit with a current capacity exceeding the required total current consumption.
If the current capacity is insufficient, use of multiple power supplies is possible.
However, if using multiple power supplies, a power supply tap should be used.

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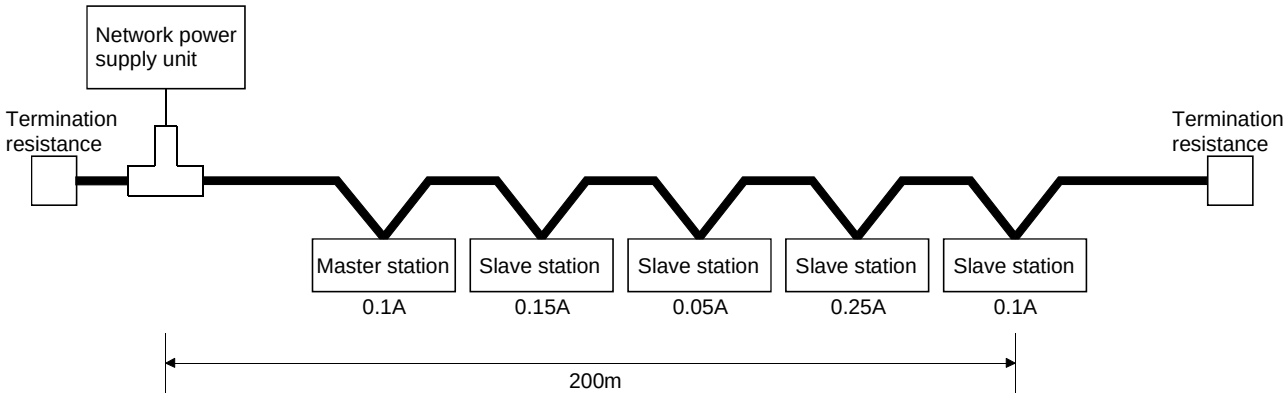
4.7.2 Calculating network power supply unit installation position and current capacity

This section explains the calculating network power supply unit installation position and current capacity.

(1) Network power supply unit connected to an end of the network

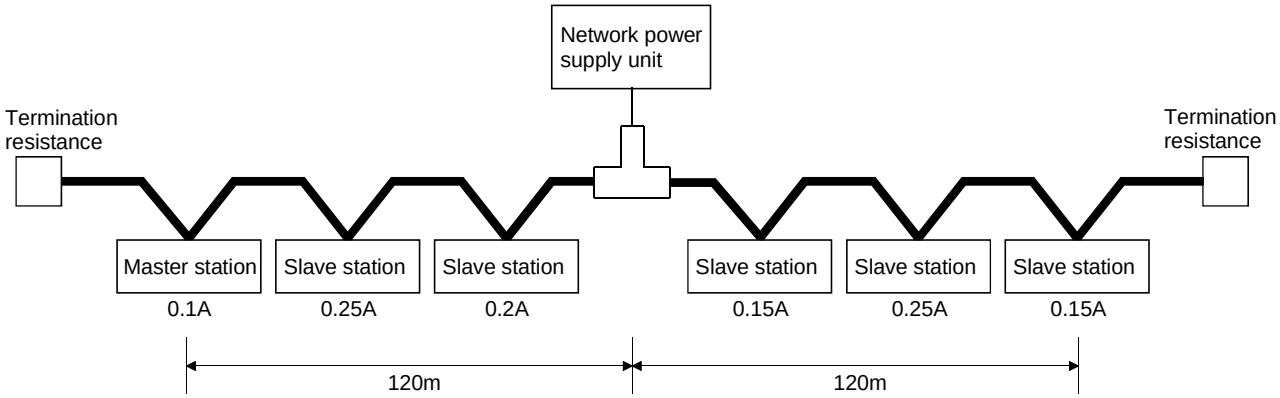
The current capacity is calculated as shown below when the network power supply unit is connected to the end of a thick-cable network with a total length of 200 m.



Total power supply distance = 200 m
Total current capacity = 0.1 A + 0.15 A + 0.05 A + 0.25 A + 0.1 A = 0.65 A
Max. current capacity of 200 m of thick cable (from Table 4.4) = 1.53 A
Therefore, this configuration allows power supply to all nodes.

(2) Network power supply unit connected to the center of the network

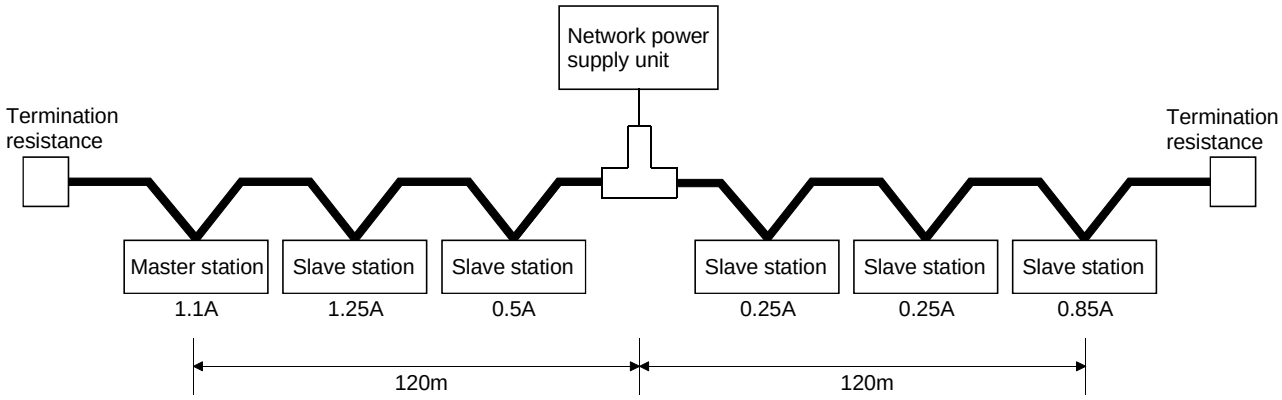
The current capacity is calculated as shown below when the network power supply unit it connected at the center of a thick-cable network.
In this case, the network power supply unit can supply twice the current compared to when it is connected to the end of the network.



Power supply distande left of the network power supply unit = power supply distance right of the network poewr supply unit = 120 m
Total current capacity to the left = 0.1 A + 0.25 A + 0.2 A = 0.55 A
Total current capacity to the right = 0.15 A + 0.25 A + 0.15 A = 0.55 A
Max. current capacity of 120 m of thick cable (from Table 4.4) = apporox. 2.56 A
(Linearly interpolated between 100 m and 150 m.)
Therefore, this configuration allows power supply to all node.

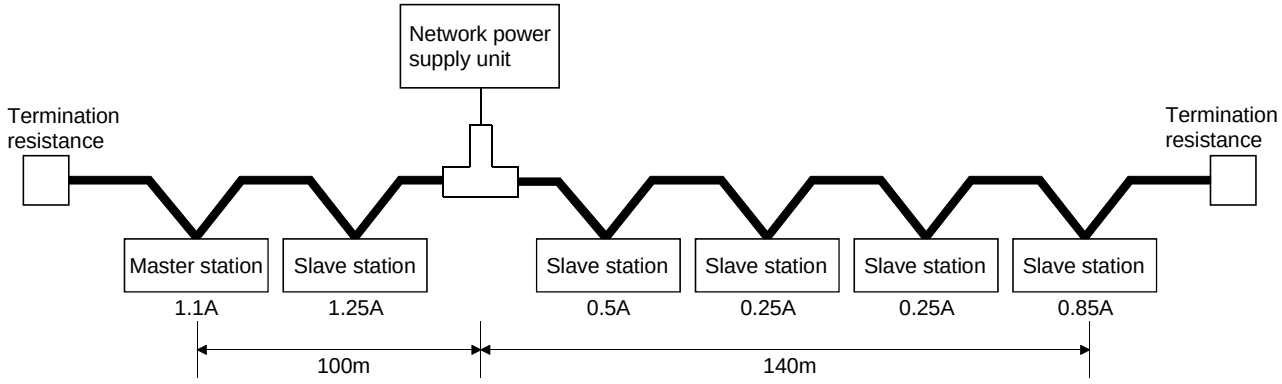
(3) Remedy for insufficient network power supply current capacity

If the network power supply unit is connected to a thick-cable network, as shown below.



Power supply distance left of the network power supply unit = power supply distance right of the network power supply unit = 120 m
Total current capacity to the left = 1.1 A + 1.25 A + 0.5 A = 2.85 A
Total current capacity to the right = 0.25 A + 0.25 A + 0.85 A = 1.35 A
Max. current capacity of 120 m of thick cable (from Table 4.4) = approx. 2.56 A
(Linearly interpolated between 100 m and 150 m.)

In this configuration, the current capacity to the left of the network power supply unit is insufficient.
If this type of situation occurs, move the network power supply unit in the direction of insufficient current capacity (to the left in the diagram above).

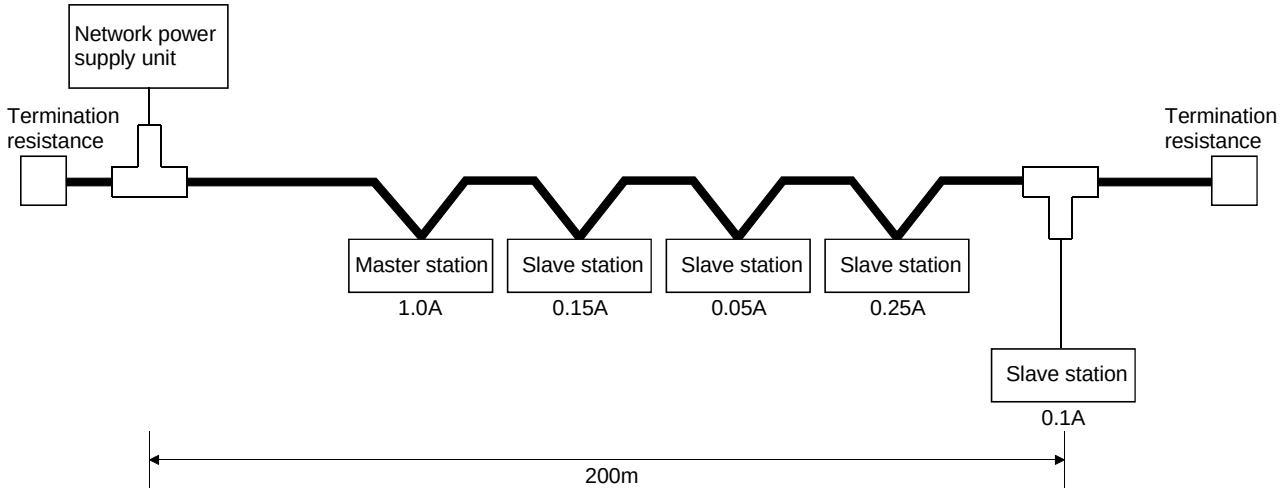


Total power supply distance left of the network power supply unit = 100 m
Total power supply distance right of the network power supply unit = 140 m
Total current capacity to the left = 1.1 A + 1.25 A = 2.35 A
Total current capacity to the right = 0.5 A + 0.25 A + 0.25 A + 0.85 A = 1.85 A
Max. current capacity of 100 m of thick cable (from Table 4.4) = approx. 2.93 A
Max. current capacity of 140 m of thick cable (from Table 4.4) = approx. 2.19 A
(Linearly interpolated between 100 m and 150 m.)

As a result of shifting the network power supply unit in the direction of insufficient current capacity, it is able to supply power to all nodes.

(4) Mixed trunk line and drop line

The current capacity is calculated as shown below when the network power supply unit is connected to a network with 200 m of thick-cable trunk line and 6 m of thin-cable drop line.



Thick-cable power supply distance = 200 m
Drop line power supply distance = 6 m
Total current capacity = 0.5 A + 0.15 A + 0.05 A + 0.25 A + 0.1 A = 1.05 A
Max. current capacity of 200 m of thick cable (from Table 4.4) = 1.53 A
Max. current capacity of 6 m of drop line (from Table 4.6) = 0.75 A
Total current of devices connected to drop line = 0.1 A

Therefore, this configuration allows power supply to all nodes.

Table 4.6 Maximum current capacity corresponding to the drop line length

Drop line length (m)	0.30	0.90	1.50	2.25	3.00	4.50	6.00
Max. current (A)	3.00	3.00	3.00	2.00	1.50	1.00	0.75

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5 PARAMETER SETTINGS

This chapter explains the setting items of the parameters that are required to run the QJ71DN91.
The following three methods are available to set the parameters.
The parameters set are saved in the flash ROM inside the QJ71DN91 as needed.
Once the parameters are saved in the flash ROM, it is not necessary to save them in the flash ROM until they are changed.
The parameters can be written to the flash ROM for a maximum of 100,000 times.

- Setting the parameters using the sequence program (see Sections 7.3 and 8.2)
- Setting the parameters using GX Configurator-DN (see Chapter 6)
- Setting the parameters using auto configuration (see Section 5.3)

5.1 Description of Parameter Settings

The following three methods can be used to set the parameters:

- Set the parameters using the TO instruction of the sequence program.
- Set the parameters using GX Configurator-DN.
- Set the parameters using auto configuration.

5.1.1 Parameters for the master function

The following explains the setting items of the parameters for the master function.

(1) Description of the parameter settings using the sequence program

The parameter settings using the sequence program include the following items:

1) Constant scan
2) nth node number (MAC ID)
3) Node number of the nth connection type of the nth slave node
4) Number of byte module points of the nth slave node
5) Number of word module points of the nth slave node
6) Number of double-word module points of the nth slave node
7) Expected packet rate of the nth slave node
8) Watchdog timeout action of the nth slave node
9) Production inhibit time of the nth slave node

The parameters 2) through 9) can be set for a maximum of 63 modules.

When configuring a DeviceNet network that uses a QJ71DN91 as the master node, it is necessary to set the node number (MAC ID) for the QJ71DN91 and each of the slave nodes.
The node numbers that can be used are between 0 and 63, and any non-duplicate node number can be set for the QJ71DN91 and each of the slave nodes within this node number range.
For the setting method of the node number (MAC ID) of the slave node, refer to the manual for the slave node.

For the method and details of the parameter settings using the sequence program, see Section 7.3.1, "Parameter settings using the sequence program", and Section 3.4.2 (13), "Parameters for the master function".

5.1.2 Parameters for the slave function

The following explains the setting items of the parameters for the slave function.

(1) Description of the parameter settings using the sequence program

The parameter settings using the sequence program include the following items:

1) Setting area of the number of slave function reception bytes
2) Setting area of the number of slave function transmission bytes

For the method and details of the parameter settings using the sequence program, see Section 8.2, "Parameter Settings Using the Sequence Program", and Section 3.4.2 (21), "Setting area of the number of slave function reception bytes/setting area of the number of slave function transmission bytes".

5.1.3 Common parameters for the master/slave functions

The following explains the setting items of the common parameters for the master/slave functions.

(1) Description of the parameter settings using the sequence program

The parameter settings using the sequence program include the following items:

1) Auto communication start settings

For the method and details of the parameter settings using the sequence program, see Section 7.3.1, "Parameter settings using the sequence program", Section 8.2, "Parameter settings using the sequence program", and section 3.4.2 (28), "auto communication start setting".

5.2 Setting Using the Sequence Program

For the method to set the parameters using the sequence program, see the following sections:

- Section 3.3.2 (7) and (8), "Saving parameter to the flash ROM: X06, save parameter to flash ROM completion: X07, save parameter to flash ROM request: Y17"
- Section 3.4.2 (13), "Parameters for the master function"
- Section 3.4.2 (21), "Setting area of the number of slave function reception bytes/setting area of the slave function transmission bytes"
- Section 7.3.1, "Parameter settings using the sequence program"
- Section 8.2, "Parameter Settings Using the Sequence Program"

5.3 Setting Using the Auto Configuration Function

The Auto Configuration function automatically creates parameters by detecting a slave node in a DeviceNet network, which is a supplementary function for creating parameters. The Auto Configuration function can reduce the load on the sequence program for parameter settings.
When the Auto Configuration function is executed, it takes up to 60 seconds until it completes.
To save the parameters to the flash ROM, execute it by setting Y17 to ON.

(1) Auto configuration operation settings (address 03F0H/1008)

Set the auto configuration type and maximum detection node numbers as follows:

1) Higher byte
   Set the auto configuration type.
   00H: All configuration
   01H: Additional configuration
   (Default value: 00H)
2) Lower byte
   Set the maximum detection node number.
   00H to 3FH (0 to 63) (Default value: 3FH)

The following two auto configuration types are available:

- All configuration: Searches all the slave nodes in the network having node numbers 0 to the maximum detection node number, except the local node number, and saves them in the "parameters for the master function" area. The areas after the detected slave nodes will be cleared.
- Additional configuration: Searches all the slave nodes in the network having node numbers 0 to the maximum detection node number, except the local node number and the slave nodes currently being set, and saves them in the "parameters for the master function" area. The areas after the detected save nodes will not be cleared.

The auto configuration is performed in the following sequence:

(a) Set the auto configuration type in the "auto configuration operation settings" area.

(b) Set the auto configuration request (Y15) to ON.

(c) The auto configuration result is stored in the "parameters for the master function" area.

(2) Description of auto configuration settings

Table 5.1 lists the items that are automatically detected and set with the Auto Configuration function.

To change the contents of settings, use the sequence program.

Table 5.1 Items set by auto configuration (1/3)

Buffer memory address (hexadecimal)	Item	Description
01D8H	Node number and message group of the 1st slave node	Lower byte: Node number of the 1st slave node (MAC ID) 0H to 3FH (0 to 63) Higher byte: Node that supports 01H → UCMM and uses either message group 3, 2 or 1. Node that supports 02H → UCMM and uses message group 2. Node that supports 03H → UCMM and uses message group 1. Node that does not support 04H → UCMM (group 2 dedicated server) * To set a reserved node, specify it with a sequence program.
01D9H	Connection type of the 1st slave node	Selects the connection type of I/O communication. 0001H = Polling 0002H = Bit strobe 0004H = Change-of-state 0008H = Cyclic
01DAH	Byte module count of the 1st slave node	Lower byte: Input byte module count Higher byte: Output byte module count (For a bit module, eight points are calculated as one byte module, and is set in hexadecimal. Ex.: 0AH for 10 bytes)
01DBH	Word module count of the 1st slave node	Lower byte: Input word module count Higher byte: Output word module count (set in hexadecimal)
01DCH	Double-word module count of the 1st slave node	Lower byte: Input double-word module count Higher byte: Output double-word module count (set in hexadecimal)
01DDH	Expected packet rate of the 1st slave node (EXPECTED PACKET RATE)	Sets the expected packet rate at a slave node. Setting value = 0000H (default value) → 500 ms * To change the setting value, specify it with a sequence program.
01DEH	Watchdog timeout action of the 1st slave node (WATCHDOG TIMEOUT ACTION)	Operation during watchdog timeout at a slave node Setting value = 0000H timeout (default value) Connection is placed in the timeout state. It will not be recovered until an operator stops communication and then resumes it. * To change the setting value, specify it with a sequence program.
01DFH	Production inhibit time of the 1st slave node (PRODUCTION INHIBIT TIME)	Sets the production inhibit time. Setting value = 0000H (default value) → 10 ms * To change the setting value, specify it with a sequence program.
01E0H to 01E7H	2nd node setting	Same as the 1st node
01E8H to 01EFH	3rd node setting	Same as the 1st node
01F0H to 01F7H	4th node setting	Same as the 1st node
01F8H to 01FFH	5th node setting	Same as the 1st node
0200H to 0207H	6th node setting	Same as the 1st node
0208H to 020FH	7th node setting	Same as the 1st node

Table 5.1 Items set by auto configuration (2/3)

Buffer memory address (hexadecimal)	Item	Description
0210H to 0217H	8th node setting	Same as the 1st node
0218H to 021FH	9th node setting	Same as the 1st node
0220H to 0227H	10th node setting	Same as the 1st node
0228H to 022FH	11th node setting	Same as the 1st node
0230H to 0237H	12th node setting	Same as the 1st node
0238H to 023FH	13th node setting	Same as the 1st node
0240H to 0247H	14th node setting	Same as the 1st node
0248H to 024FH	15th node setting	Same as the 1st node
0250H to 0257H	16th node setting	Same as the 1st node
0258H to 025FH	17th node setting	Same as the 1st node
0260H to 0267H	18th node setting	Same as the 1st node
0268H to 026FH	19th node setting	Same as the 1st node
0270H to 0277H	20th node setting	Same as the 1st node
0278H to 027FH	21st node setting	Same as the 1st node
0280H to 0287H	22nd node setting	Same as the 1st node
0288H to 028FH	23rd node setting	Same as the 1st node
0290H to 0297H	24th node setting	Same as the 1st node
0298H to 029FH	25th node setting	Same as the 1st node
02A0H to 02A7H	26th node setting	Same as the 1st node
02A8H to 02AFH	27th node setting	Same as the 1st node
02B0H to 02B7H	28th node setting	Same as the 1st node
02B8H to 02BFH	29th node setting	Same as the 1st node
02C0H to 02C7H	30th node setting	Same as the 1st node
02C8H to 02CFH	31st node setting	Same as the 1st node
02D0H to 02D7H	32nd node setting	Same as the 1st node
02D8H to 02DFH	33rd node setting	Same as the 1st node
02E0H to 02E7H	34th node setting	Same as the 1st node
02E8H to 02EFH	35th node setting	Same as the 1st node
02F0H to 02F7H	36th node setting	Same as the 1st node
02F8H to 02FFH	37th node setting	Same as the 1st node
0300H to 0307H	38th node setting	Same as the 1st node
0308H to 030FH	39th node setting	Same as the 1st node
0310H to 0317H	40th node setting	Same as the 1st node
0318H to 031FH	41st node setting	Same as the 1st node
0320H to 0327H	42nd node setting	Same as the 1st node
0328H to 032FH	43rd node setting	Same as the 1st node
0330H to 0337H	44th node setting	Same as the 1st node
0338H to 033FH	45th node setting	Same as the 1st node
0340H to 0347H	46th node setting	Same as the 1st node
0348H to 034FH	47th node setting	Same as the 1st node
0350H to 0357H	48th node setting	Same as the 1st node
0358H to 035FH	49th node setting	Same as the 1st node
0360H to 0367H	50th node setting	Same as the 1st node
0368H to 036FH	51st node setting	Same as the 1st node
0370H to 0377H	52nd node setting	Same as the 1st node
0378H to 037FH	53rd node setting	Same as the 1st node
0380H to 0387H	54th node setting	Same as the 1st node

Table 5.1 Items set by auto configuration (3/3)

Buffer memory address (hexadecimal)	Item	Description
0388H to 038FH	55th node setting	Same as the 1st node
0390H to 0397H	56th node setting	Same as the 1st node
0398H to 039FH	57th node setting	Same as the 1st node
03A0H to 03A7H	58th node setting	Same as the 1st node
03A8H to 03AFH	59th node setting	Same as the 1st node
03B0H to 03B7H	60th node setting	Same as the 1st node
03B8H to 03BFH	61st node setting	Same as the 1st node
03C0H to 03C7H	62nd node setting	Same as the 1st node
03C8H to 03CFH	63rd node setting	Same as the 1st node

5 - 6

6 UTILITY PACKAGE (GX Configurator-DN)

6.1 Functions of the Utility Package

Table 6.1 lists the functions of the utility package (GX Configurator-DN).

Table 6.1 Utility package (GX Configurator-DN) function list

Function	Description	Reference section
Auto refresh	(1) Sets the QJ71DN91's buffer memory that refreshes automatically. • Master Function Communication Status • Master Function For Error Information • Bus Error Counter • Bus Off Counter • Each Node Configuration Status • Each Node Communication Status, Each Node Communication Error Status • Each Node Obstacle Status • Down Node Detection Disable Status • Present Link Scan Time • Minimum Link Scan Time • Maximum Link Scan Time • Slave Function Communication Status • Slave Function For Error Information • Master Function For IO Address Area • Master Function Receive Data • Master Function Transmit Data • Slave Function Receive Data • Slave Function Transmit Data (2) The values stored in the QJ71DN91's buffer memory for which auto refresh has been set will automatically be read when the END instruction of the PLC CPU is executed.	Section 6.4
Monitor/test	Monitors/tests the buffer memory and I/O signals of the QJ71DN91. In addition, auto configuration and parameter backup can be performed. • Model Name Display • Node Number • Mode Switch Number • Bus Error Counter • Bus Off Counter • H/W Test Item Display Area • H/W Test Result Storing Area • Master Function Communication Status • Master Function For Error Information • Present Link Scan Time • Minimum Link Scan Time • Maximum Link Scan Time • Slave Function Communication Status • Slave Function For Error Information • X/Y Monitor/Test • Parameter Area Monitor/Test • Save Parameter To Flash ROM • Each Node Configuration Status Monitor • Each Node Communication Status Monitor • Each Node Communication Error Status Monitor • Each Node Obstacle Status Monitor • Down Node Detection Disable Status • Message Communication Area Monitor/Test • Master Function For IO Address Area Monitor • Master Function Receive Data Monitor • Master Function Transmit Data Monitor/Test • Slave Function Receive Data Monitor • Slave Function Transmit Data Monitor/Test • Auto Configuration • Flash ROM Parameter Clear • Parameter Backup	Section 6.5
Flash ROM setting	Edits the data to be set in the flash ROM offline.	Section 6.6

6.2 Installing and Uninstalling the Utility Package

See "Method of installing the MELSOFT Series" attached with the utility package regarding the install and uninstall operation for the utility package.

6.2.1 User precautions

The following explains the precautions on using the GX Configurator-DN.

(1) Important safety information

Since GX Configurator-DN is add-in software for GX Developer, read "Safety Precautions" and the basic operating procedures in GX Developer Operating Manual.

(2) About installation

The GX Configurator-DN is an add-in package for GX Developer Version 4 or later.
Therefore, install GX Configurator-DN into the personal computer where the GX Developer Version 4 or later product has already been installed.

(3) About display-screen errors while using the intelligent function module utility

There may be cases in which the screen will not properly display while the intelligent function module utility is being used, due to a lack of system resources. If this occurs, close the intelligent function module utility first and then GX Developer (program, comments, etc.) and other applications. Next, restart GX Developer and the intelligent function module utility.

(4) To start the intelligent function module utility

(a) In GX Developer, select "QCPU (Q mode)" for the PLC series and specify the project.
If something other than "QCPU (Q mode) " is selected for the PLC series, or if the project is not specified, the intelligent function module utility will not start.

(b) Multiple intelligent function module utilities can be started.
However, the [Open file]/[Save file] intelligent function module's parameter operations can only be performed by a single intelligent function module utility. Other intelligent function module utilities can perform the [Monitor/test] operation only.

(5) How to switch screens when two or more intelligent function module utilities are started

When two or more intelligent function module utility screens cannot be displayed side by side, use the task bar to change the intelligent function module utility screen so that it is displayed on top of other screens.

(6) About the number of parameters that can be set in GX Configurator-DN

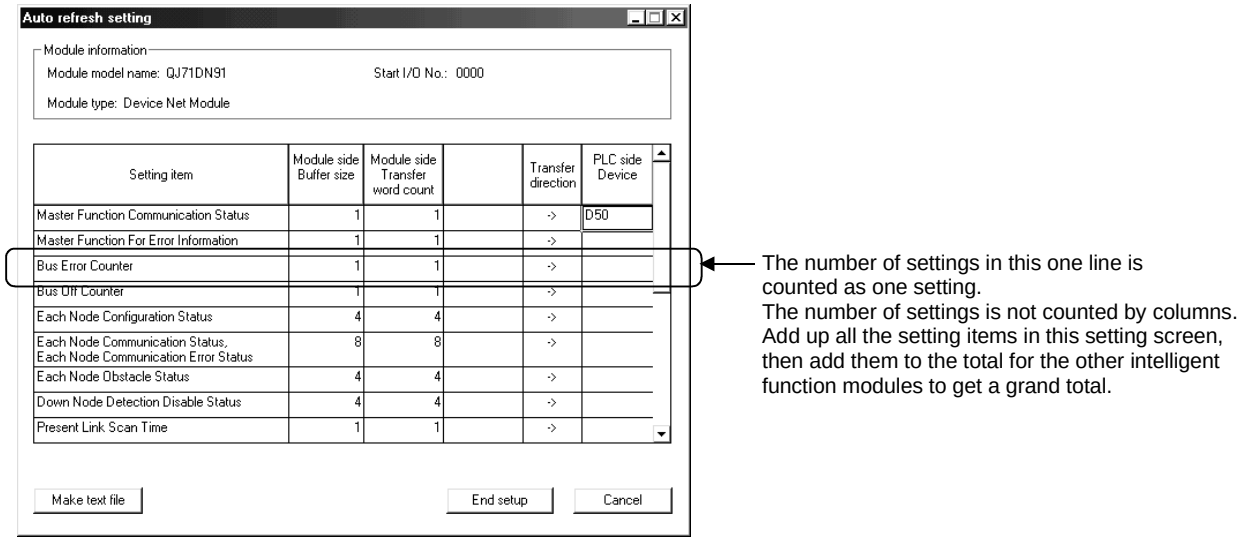
The number of parameters that can be set by the GX Configurator for an intelligent function module installed in the CPU module and in a remote I/O station of the MELSECNET/H network system is limited.

Intelligent function module installation object	Maximum number of parameter settings	
	Initial setting	Automatic refresh setting
Q00J/Q00/Q01CPU	512	256
Q02/Q02H/Q06H/Q12H/Q25HCPU	512	256
Q12PH/Q25PHCPU	512	256
MELSECNET/H remote I/O station	512	256

For example, if multiple intelligent function modules are installed in a remote I/O station, set the GX Configurator so that the number of parameter settings of all the intelligent function modules does not exceed the maximum number of parameter settings.The total number of parameter settings is calculated separately for the initial setting and for the automatic refresh setting.
The number of parameter settings that can be set for one module in the GX Configurator-DN is as shown below.

Object Module	Initial setting	Automatic refresh setting
QJ71DN91	0 (Not used)	18 (Maximum number of settings)

Example) Counting the number of parameter settings in the automatic refresh setting



The number of settings in this one line is counted as one setting.
The number of settings is not counted by columns.
Add up all the setting items in this setting screen, then add them to the total for the other intelligent function modules to get a grand total.

6.2.2 Operating environment

The operating environment of the personal computer where the GX Configurator-DN is used is explained.

Item		Peripheral devices
Installation (Add-in) destination ＊1		Add-in to GX Developer Version 4 (English version) or later ＊2
Computer main unit		Personal computer on which Windows® operates.
	CPU	Refer to the following table "Used operating system and performance required for personal computer".
	Required memory	
Hard disk free space	For installation	65 MB or more
	For operation	10 MB or more
Display		800 × 600 dot or more resolution ＊3
Operating system		Microsoft® Windows® 95 Operating System (English version) Microsoft® Windows® 98 Operating System (English version) Microsoft® Windows® Millennium Edition Operating System (English version) Microsoft® Windows NT® Workstation Operating System Version 4.0 (English version) Microsoft® Windows® 2000 Professional Operating System (English version) Microsoft® Windows® XP Professional Operating System (English version) Microsoft® Windows® XP Home Edition Operating System (English version)

＊1: Install the GX Configurator-DN in GX Developer Version 4 or higher in the same language.
GX Developer (English version) and GX Configurator-DN (Japanese version) cannot be used in combination, and GX Developer (Japanese version) and GX Configurator-DN (English version) cannot be used in configuration.

＊2: GX Configurator-DN cannot be used as an add-in with GX Developer Version 3 or earlier versions.

＊3: Setting fonts Size of Windows® for "Large Fonts" may cause the text to extend off screen. Therefore, choose "Small Fonts".

Used operating system and performance required for personal computer

Operating system		Performance Required for Personal Computer	
		CPU	Required memory
Windows® 95		Pentium® 133MHz or more	32MB or more
Windows® 98		Pentium® 133MHz or more	32MB or more
Windows® Me		Pentium® 150MHz or more	32MB or more
Windows NT® Workstation 4.0		Pentium® 133MHz or more	32MB or more
Windows® 2000 Professional		Pentium® 133MHz or more	64MB or more
Windows® XP Professional	"XP compatibility mode" and "Fast User Switching" are not supported.	Pentium® 300MHz or more	128MB or more
Windows® XP Home Edition		Pentium® 300MHz or more	128MB or more

6.3 Explanation of Utility Package Operation

6.3.1 How to perform common utility package operations

(1) Available control keys

Special keys that can be used during operation of the utility package and their applications are shown in the table below.

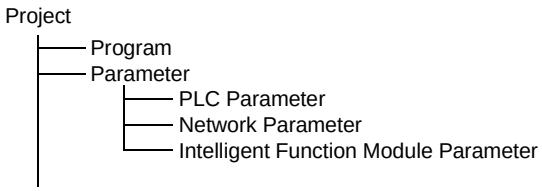
Name of key	Application
Esc	Cancels a newly entered value when entering data in a cell. Close the window.
Tab	Moves between controls in the window.
Ctrl	Used in conjunction with the mouse when multiple cells are selected in the selection test.
Delete	Deletes the character where the cursor is positioned. When a cell is selected, clears all of the setting contents.
Back Space	Deletes the character where the cursor is positioned.
↑ ↓ ← →	Moves the cursor.
Page up	Moves the cursor one page up.
Page Down	Moves the cursor one page down.
Enter	Confirms the value entered in the cell.

(2) Data to be created with the utility package

The data and files shown below that are created with the utility package are also processed using GX Developer operation. Figure 6.1 shows which operation processes which data or file.

<Intelligent function module parameter>

(a) This data is created with the automatic refresh setting, and stored in the intelligent function module parameter file of the project to be created using GX Developer.



(b) Steps 1) to 3) shown in Figure 6.1 are performed using the following operation.

1) Operating from GX Developer.
[Project] → [Open existing project] / [Save project]/ [Save project as]

2) Operating from the utility parameter setting module selection screen.
[File] → [Open file] / [Save file]

3) Operating from GX Developer.
[Online] → [Read from PLC] / [Write to PLC] → "Intelligent function module parameters"
Or, operate from the utility parameter setting module selection screen.
[Online] → [Read from PLC] / [Write to PLC]

<Flash ROM data>

(a) The data set with flash ROM settings is called the flash ROM data, which can be saved in a desired directory different from the GX Developer project.

(b) Steps 4) and 5) shown in Figure 6.1 are performed as follows:

4) This step can be executed from the Flash ROM Setting screen or Monitor/Test screen.

"Flash ROM Setting screen" → File read / File save

"Monitor/Test screen" → File read / File save

5) This step can be executed from the Monitor/Test screen of the utility.

"Monitor/Test screen" → Read from module / Write to module

<Text files>

(a) Text files can be created by performing the initial setting, auto refresh setting, or operation of Make text file on the Monitor/Test screen. The text files can be utilized to create user documents.

(b) The text files can be saved in a desired directory.

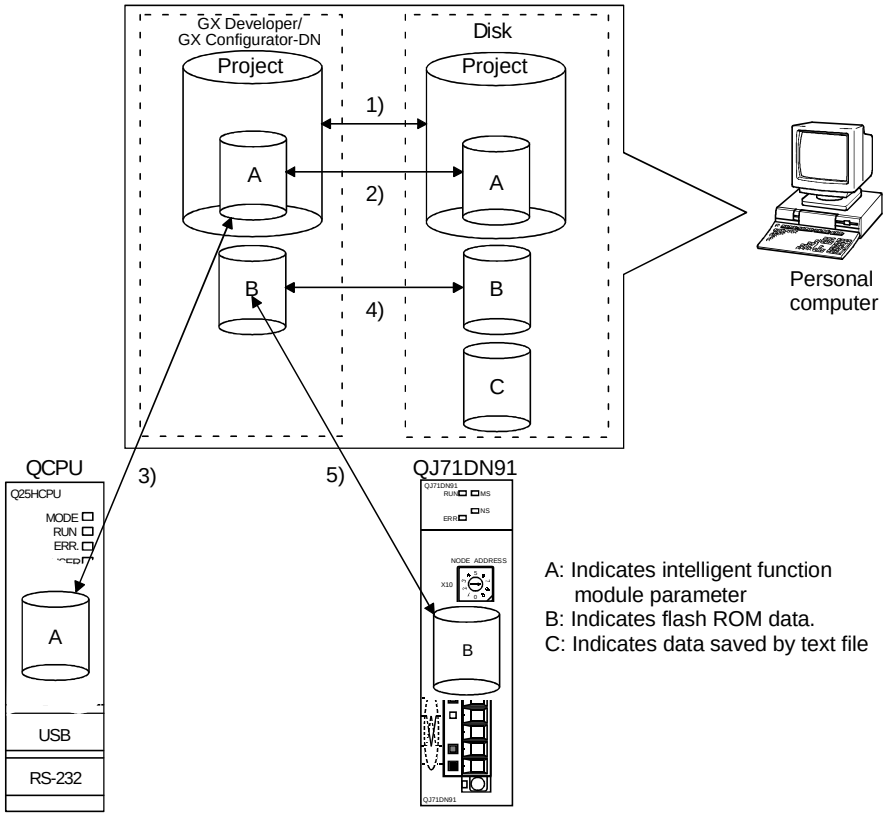
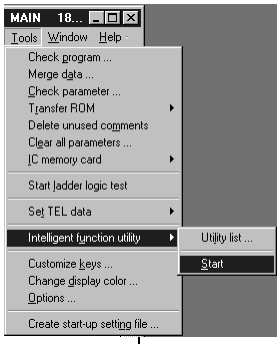


Figure 6.1 Correlation chart for data created with the utility package

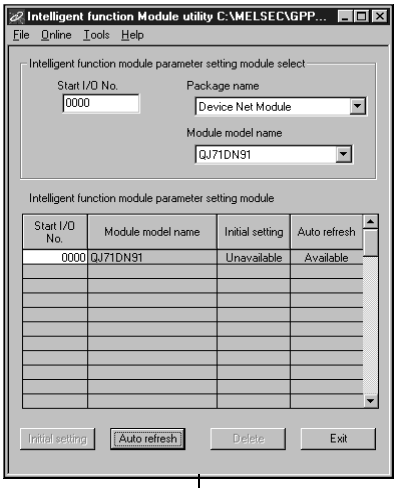
6.3.2 Overview of operation

GX Developer screen



[Tools] - [Intelligent function utility] - [Start]

Screen for intelligent function module parameter setting module select



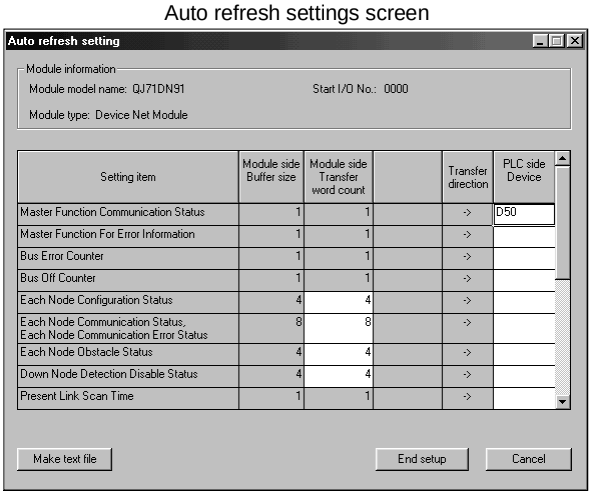
See Section 6.3.3.

Enter "Start I/O No.," then select "Package name" and "Module model name."

1)

Auto refresh

Auto refresh settings screen

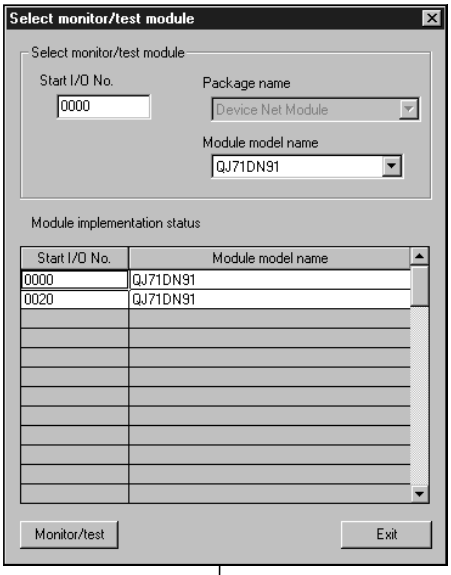


See Section 6.4.

1)

[Online] - [Monitor/test]

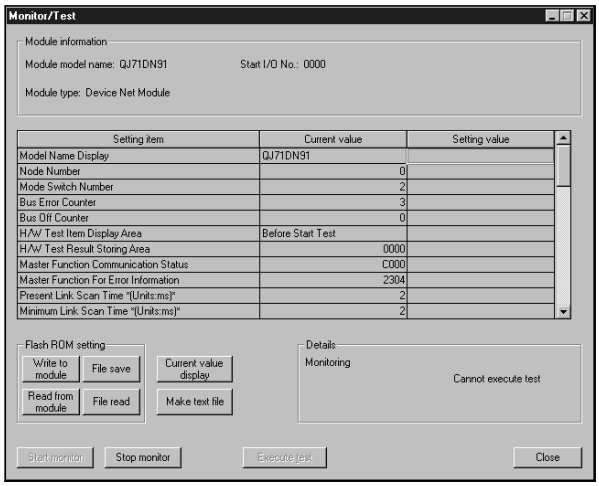
Select monitor/test module



Monitor/test

Enter "Start I/O No.," then select "Package name" and "Module model name."

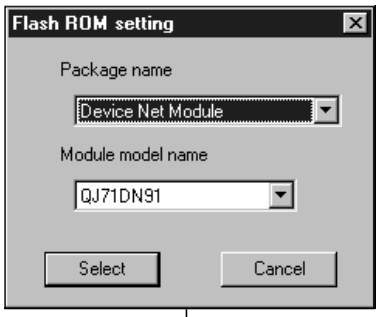
Monitor/Test screen



See Section 6.5.

[Tools] - [Flash ROM setting]

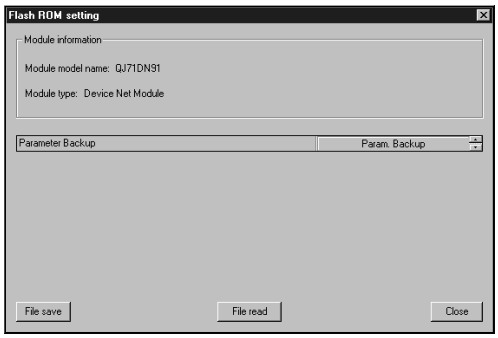
Flash ROM settings screen



Select

Select "Package name" and "Module model name."

Flash ROM settings screen



See Section 6.6.

6.3.3 Starting the intelligent function module utility

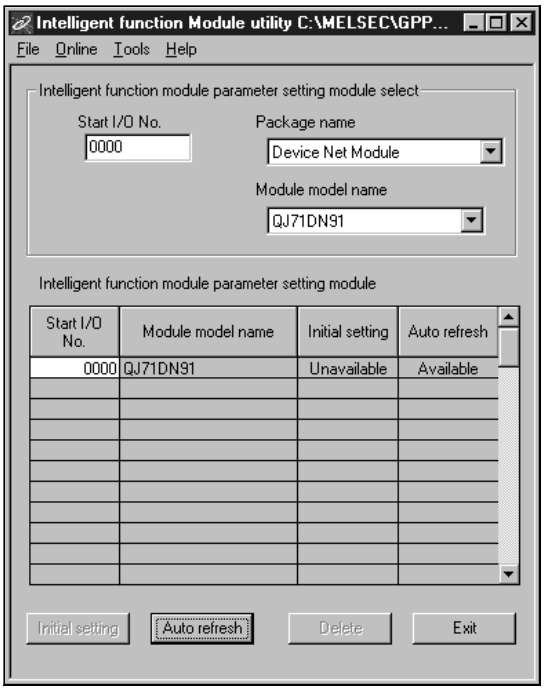
[Purpose of Setting]

By starting the intelligent function module utility from the GX Developer, display the Parameter Setting Module Selection screen. From this screen, the screens used to perform auto refresh and monitor/test module selection (selecting the module for which monitoring/testing is to be performed) of the QJ71DN91 can be started.

[Startup procedure]

[Tools] → [Intelligent function Module utility] → [Start]

[Setting screen]



[Explanation of items]

(1) Startup operation on each screen

(a) Starting auto refresh settings

"Start I/O No.＊" → "Package name" → "Module model name" → Auto refresh

(b) Monitor/Test Module Selection screen

[Online] → [Monitor/test]

＊ Enter the start I/O No. in hexadecimal.

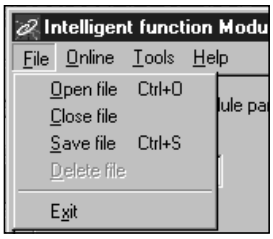
(2) Explanation of screen command buttons

Delete	Deletes the initial setting and auto refresh setting of the selected module.
Exit	Closes the Parameter Setting Module Selection screen.

(3) Menu bar

(a) File items

With file operation, the parameters of the intelligent function module for the project opened with the GX Developer can be manipulated.



[Open file] : Reads the parameter file.

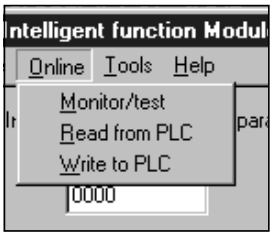
[Close file] : Closes the parameter file. If the data in the file was modified, a dialog box asking whether or not to save the file will appear.

[Save file] : Saves the parameter file.

[Delete file] : Deletes the parameter file.

[Exit] : Closes the Parameter Setting Module Selection screen.

(b) Online items



[Monitor/test] : Starts the Monitor/Test Module Selection screen.

[Read from PLC] : Reads the intelligent function module parameters from the CPU module.

[Write to PLC] : Writes the intelligent function module parameters to the CPU module.

POINT

(1) Saving the intelligent function module parameter files

Since files cannot be saved using the GX Developer's project save operation, save the files using the Parameter Setting Module Selection screen described above.

(2) Reading/writing the intelligent function module parameters from/to a PC using the GX Developer

(a) The intelligent function module parameters can be read from and written into the PC after they are saved in a file.

(b) Set the subject PLC CPU using the GX Developer as follows: [Online] → [Specify Connection Destination].

(c) Use [Read from PC] or [Write to PC] of the GX Developer when mounting the QJ71DN91 to a remote I/O node.

(3) Checking for the required utility

The head I/O is displayed in the Intelligent function module utility setting screen, but a "*" may be displayed for the model name.

This means that either the required utility is not installed or that the utility cannot be started from the GX Developer.

Check for the required utility in [Tools] - [Intelligent function utility] - [Utility list...] in GX Developer, and set it.

6.4 Auto Refresh Settings

[Purpose of Setting]

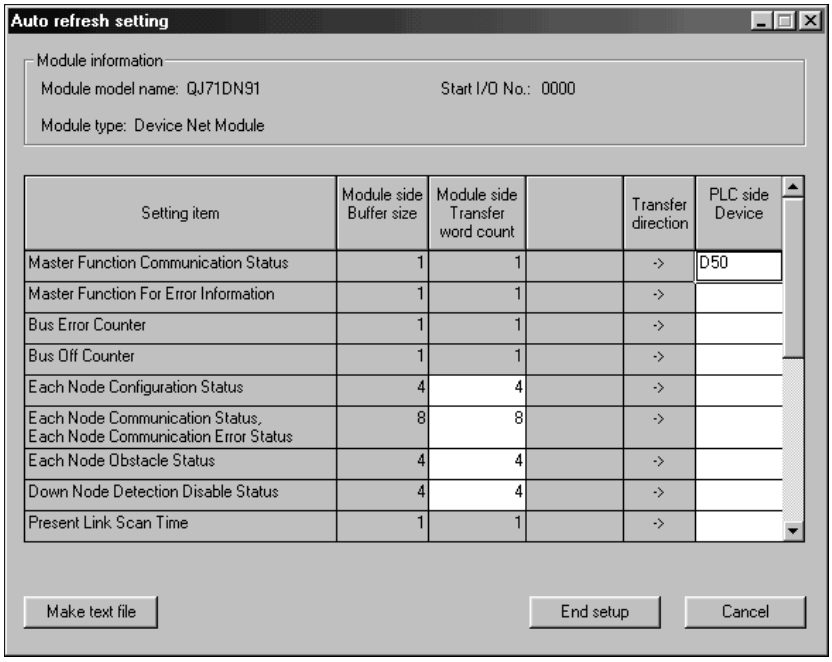
Sets the QJ71DN91's buffer memory that is automatically refreshed.
For the auto refresh setting items, see Section 6.1.
Reading and writing with the sequence program will no longer be required by setting auto refresh.

[Startup procedure]

"Start I/O No.＊" → "Package name" → "Module model name" → Auto refresh

＊ Enter the start I/O No. in hexadecimal.

[Setting screen]



POINT

The data set using GX Configurator-DN of Version 1.15R or later should not be edited or written using GX Configurator-DN of Version 1.14Q or earlier.
Doing so will corrupt the set data.
If a numerical value has been entered accidentally, press Cancel to interrupt.

[Explanation of items]

(1) Description of the screen display

Buffer size on module side	:	Displays the buffer memory size of the setting item.
Number of transfer words on module side	:	Displays the number of words to be transferred.
Transfer direction	:	"←" indicates that data is written from the PLC CPU to the buffer memory. "→" indicates that data is read from the buffer memory to the PLC CPU
Device on CPU side	:	Enter the device on the CPU module side to be automatically refreshed. The devices that can be used are X, Y, M, L, B, T, C, ST, D, W, R, and ZR. When using bit device X, Y, M, L or B, set a number that can be divided by 16 points (examples: X10, Y120, M16, etc.). In addition, the buffer memory data is stored in 16-point portions starting from the device number that was set. For example, if X10 is set, data will be stored from X10 to X1F.

(2) Explanation of command buttons

Make text file	Creates a file containing the screen data in text file format.
End setup	Saves the set data and ends the operation.
Cancel	Cancels the setting and ends the operation.

POINT

- The auto refresh settings are stored in the intelligent function module parameters.
  The auto refresh settings become valid by turning the power OFF and then ON or resetting the CPU module after the intelligent function module parameters are written to the CPU module.
- The auto refresh settings cannot be changed from the sequence program. However, processing equivalent to auto refresh can be added using the FROM/TO instruction of the sequence program.

6.5 Monitor/Test

[Purpose of Setting]

Buffer memory monitoring/testing and I/O signal monitoring/testing are started from this screen.

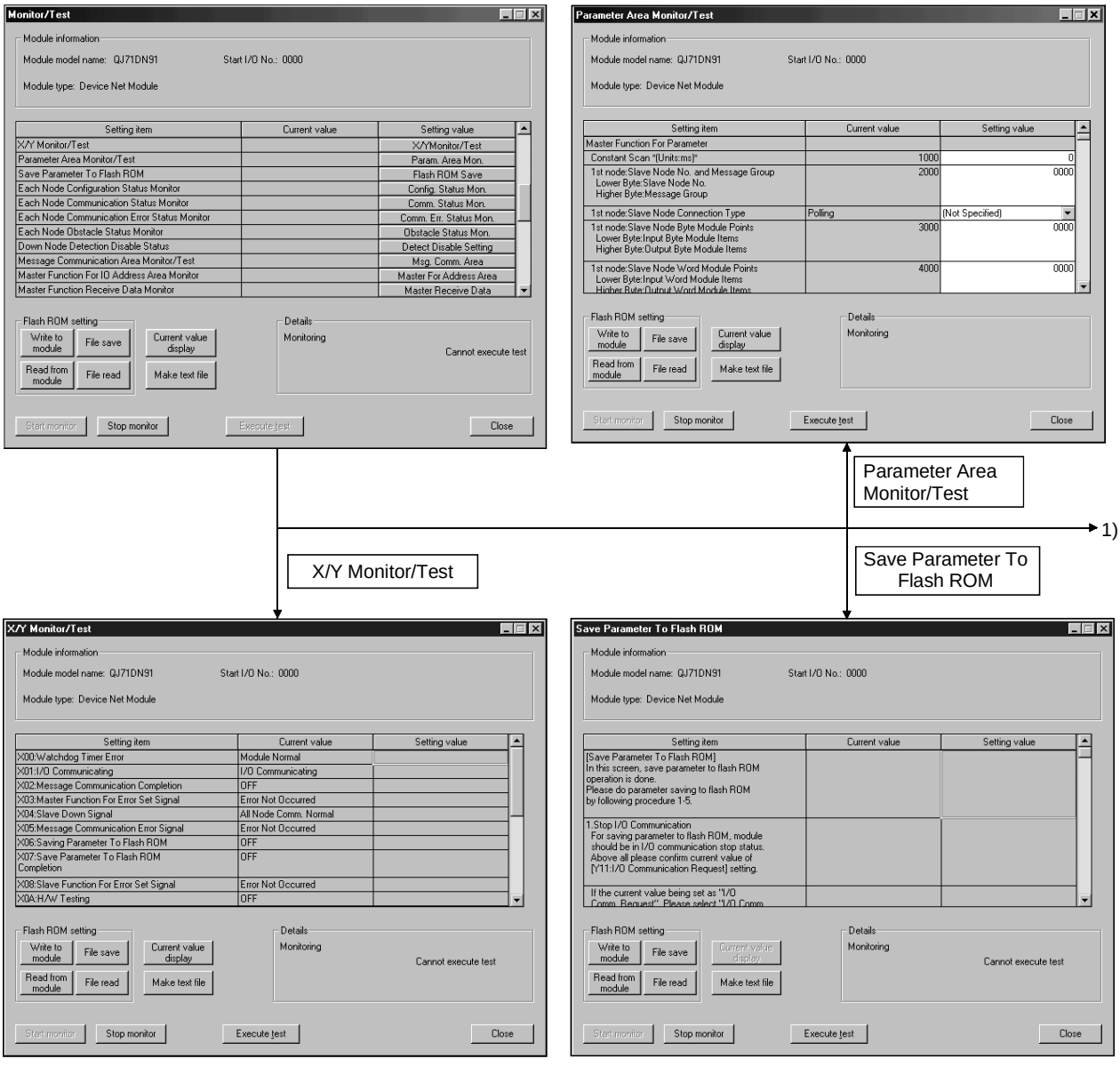
[Startup procedure]

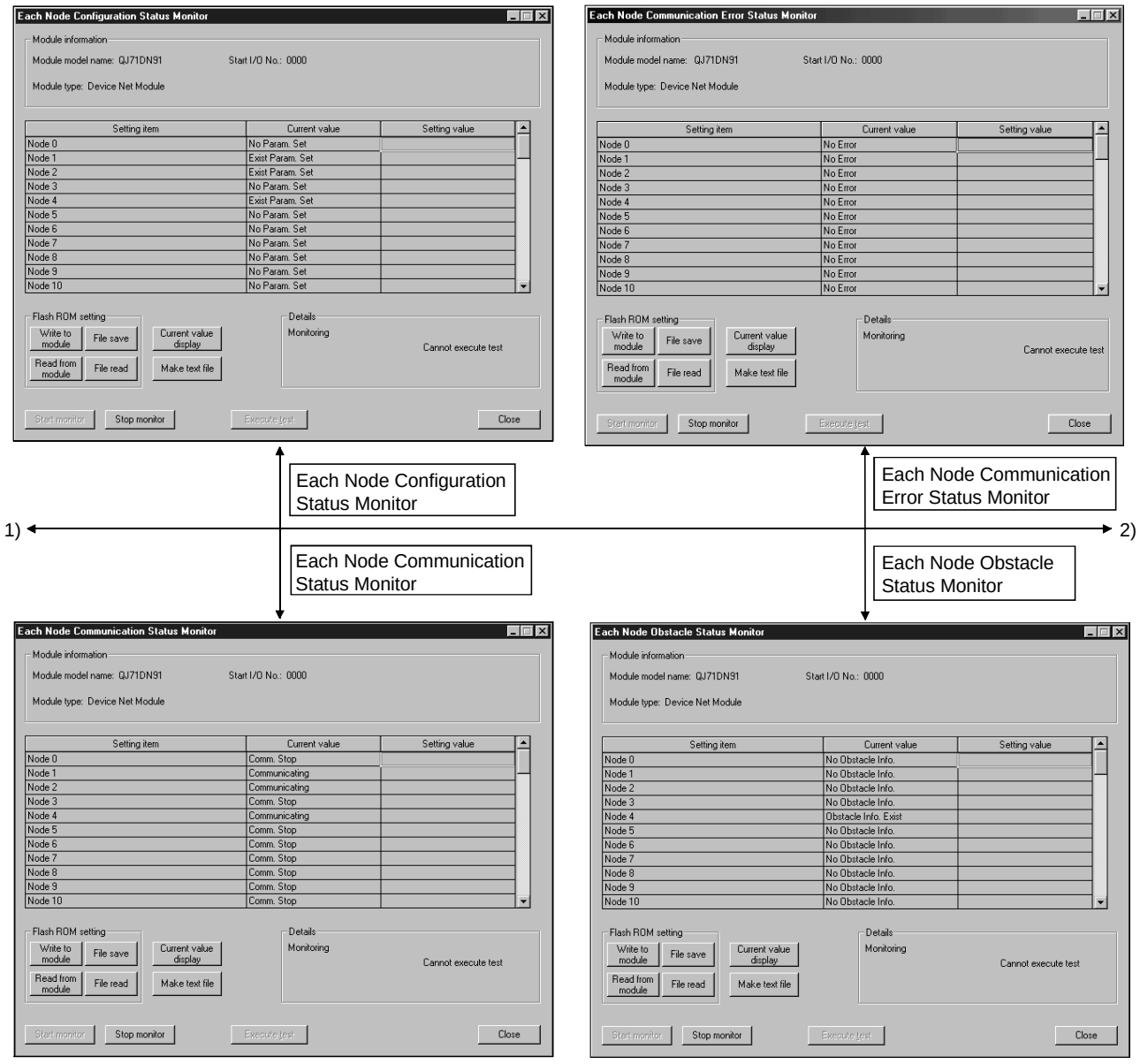
Select monitor/test module screen → "Start I/O No.＊" → "Package name" → "Module model name" → Monitor/test

＊ Enter the start I/O No. in hexadecimal.

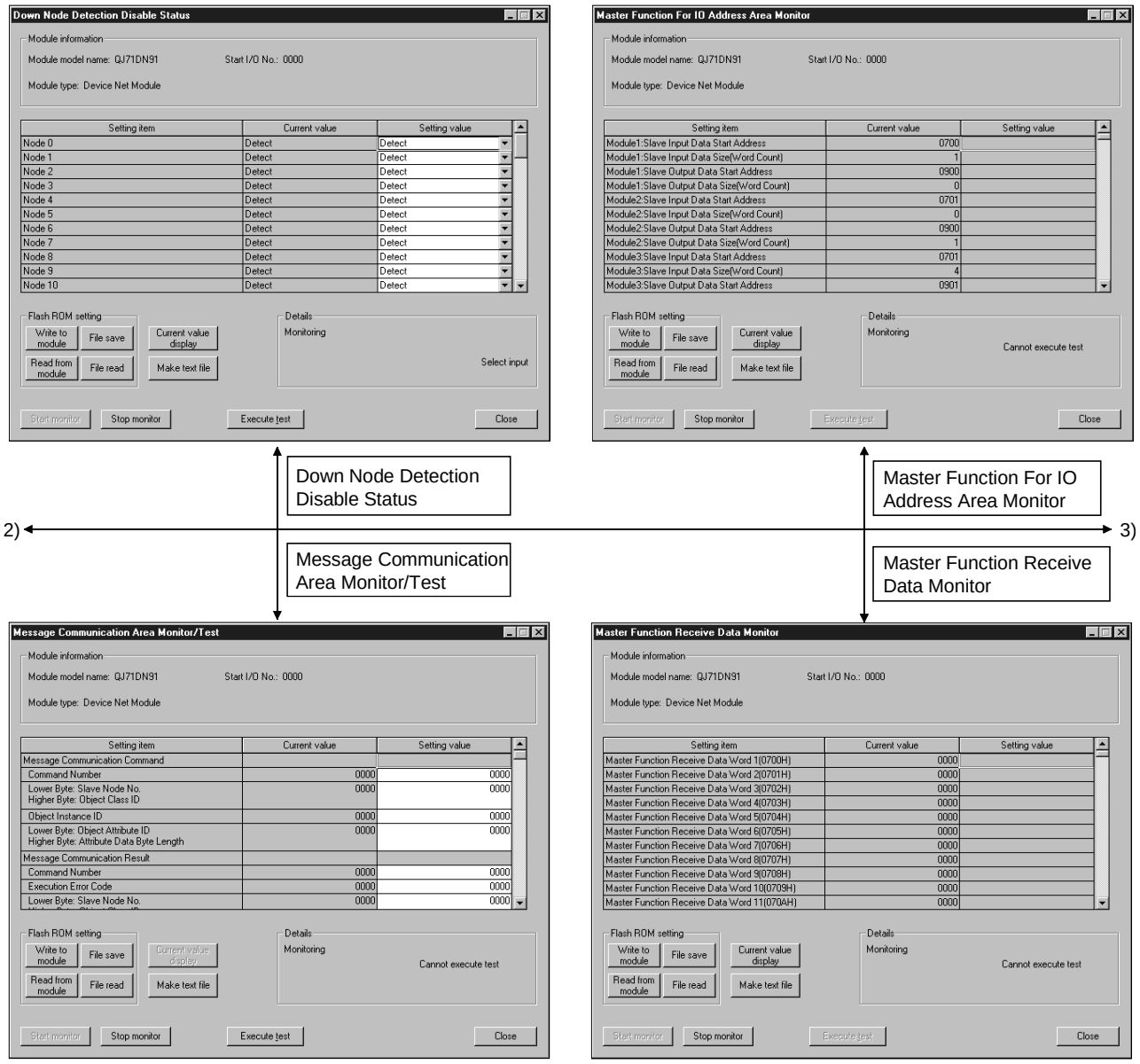
The screen can also be started from the GX Developer Version 6 or later system monitor.
See GX Developer Operating Manual for details.

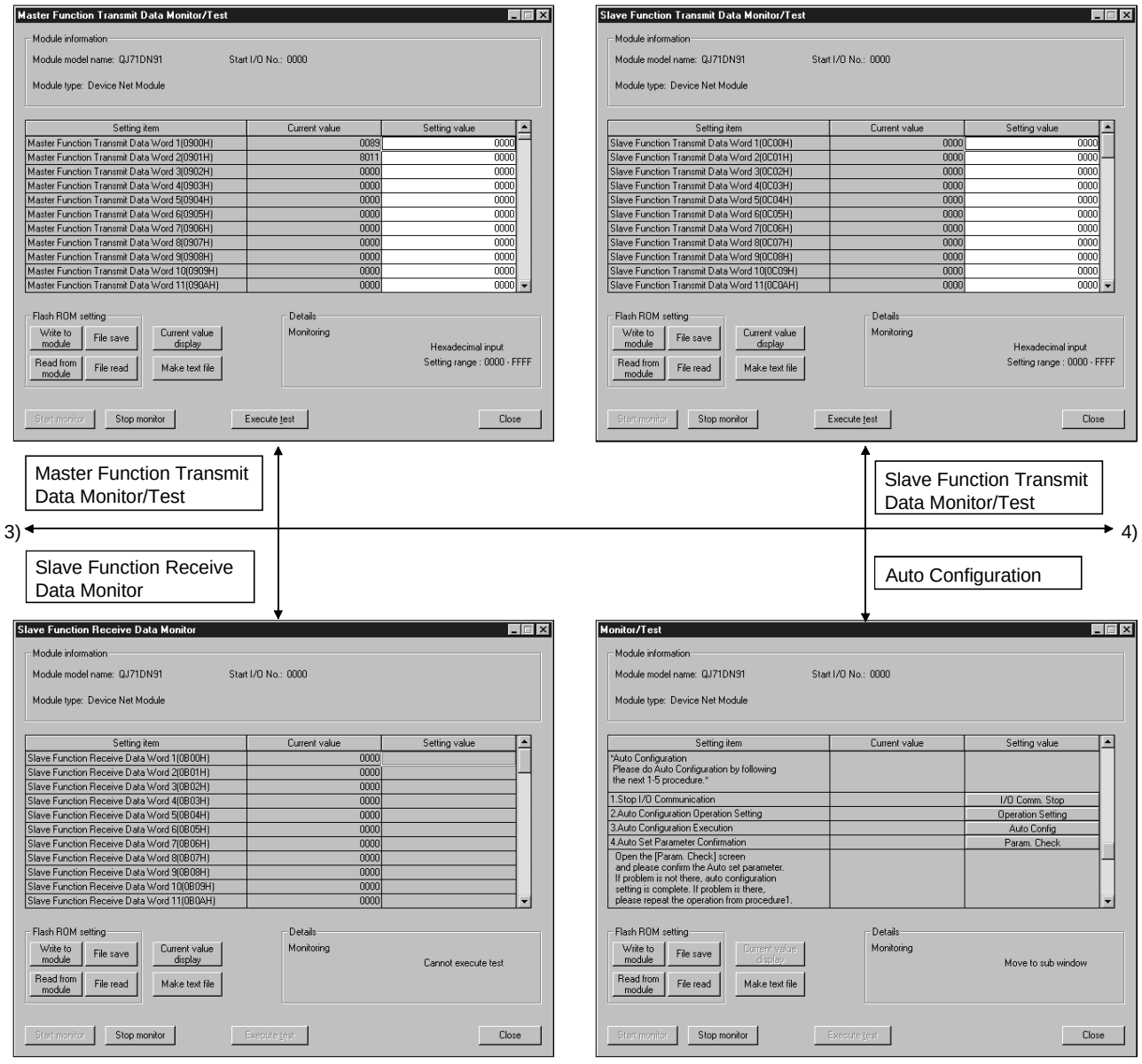
[Setting screen]

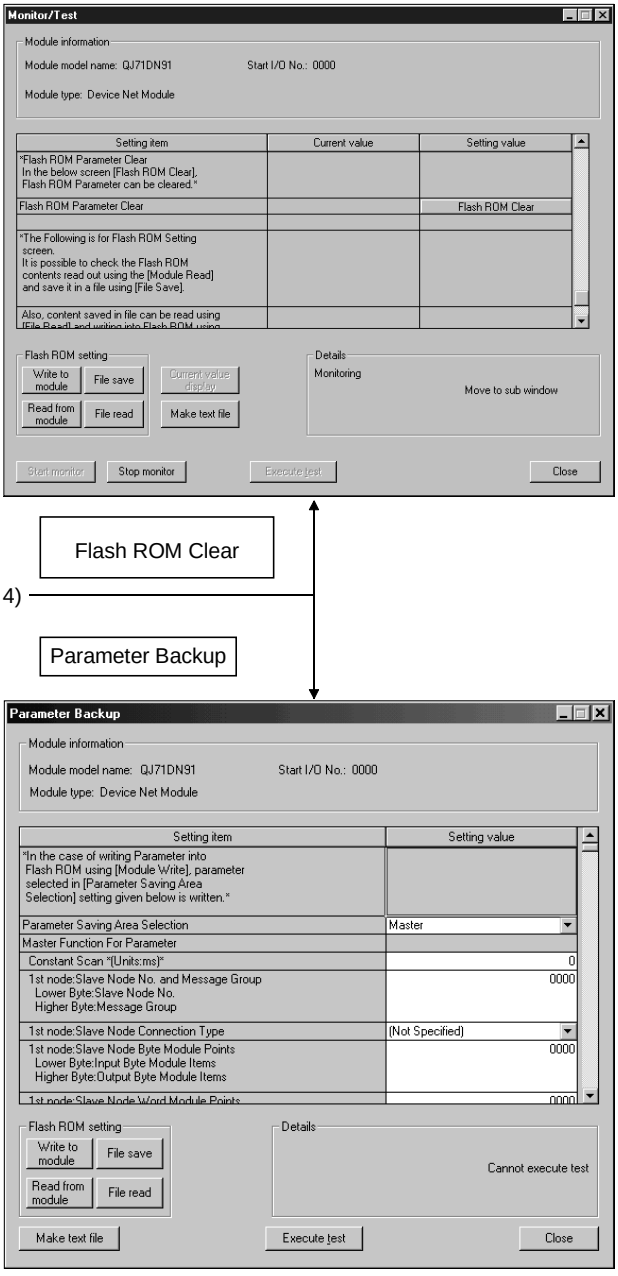



Each Node Configuration Status Monitor
Each Node Communication Error Status Monitor
Each Node Configuration Status Monitor
Each Node Communication Error Status Monitor
1)
2)
Each Node Communication Status Monitor
Each Node Obstacle Status Monitor
Each Node Communication Status Monitor
Each Node Obstacle Status Monitor

6 - 15


Down Node Detection Disable Status
Module information
Module model name: QJ71DN91
Start I/O No.: 0000
Module type: Device Net Module
Setting item
Current value
Setting value
Node 0
Node 1
Node 2
Node 3
Node 4
Node 5
Node 6
Node 7
Node 8
Node 9
Node 10
Detect
Flash ROM setting
Write to module
File save
Read from module
File read
Current value display
Make text file
Details
Monitoring
Select input
Start monitor
Stop monitor
Execute test
Close
Master Function For IO Address Area Monitor
Module1:Slave Input Data Start Address
Module1:Slave Input Data Size(Word Count)
Module1:Slave Output Data Start Address
Module1:Slave Output Data Size(Word Count)
Module2:Slave Input Data Start Address
Module2:Slave Input Data Size(Word Count)
Module2:Slave Output Data Start Address
Module2:Slave Output Data Size(Word Count)
Module3:Slave Input Data Start Address
Module3:Slave Input Data Size(Word Count)
Module3:Slave Output Data Start Address
Cannot execute test
Down Node Detection Disable Status
Master Function For IO Address Area Monitor
2)
3)
Message Communication Area Monitor/Test
Master Function Receive Data Monitor
Message Communication Area Monitor/Test
Message Communication Command
Command Number
Lower Byte: Slave Node No.
Higher Byte: Object Class ID
Object Instance ID
Lower Byte: Object Attribute ID
Higher Byte: Attribute Data Byte Length
Message Communication Result
Command Number
Execution Error Code
Lower Byte: Slave Node No.
Master Function Receive Data Monitor
Master Function Receive Data Word 1(0700H)
Master Function Receive Data Word 2(0701H)
Master Function Receive Data Word 3(0702H)
Master Function Receive Data Word 4(0703H)
Master Function Receive Data Word 5(0704H)
Master Function Receive Data Word 6(0705H)
Master Function Receive Data Word 7(0706H)
Master Function Receive Data Word 8(0707H)
Master Function Receive Data Word 9(0708H)
Master Function Receive Data Word 10(0709H)
Master Function Receive Data Word 11(070AH)


Master Function Transmit Data Monitor/Test
Slave Function Transmit Data Monitor/Test
3)
4)
Slave Function Receive Data Monitor
Auto Configuration
Slave Function Receive Data Monitor
Monitor/Test



Parameters saved in a file can be edited with "Flash ROM setting".

[Explanation of items]

(1) Description of screen display

Setting item : Displays the I/O signal and buffer memory names.
Current value : Monitors the I/O signal status and present buffer memory value.
Setting (value) : Enter or select the value to be written into the buffer memory with test operation.

(2) Explanation of the command buttons

Write to module	Writes the parameters into the flash ROM of the QJ71DN91.
Read from module	Reads the parameters from the flash ROM of the QJ71DN91.
File save	Saves the parameters in the hard disk, etc.
File read	Reads the parameters saved in the hard disk, etc.
Current value display	Displays the current value of the item selected. (This is used to check text that cannot be displayed in the current value field. However, in this utility package, all items can be displayed in the display fields).
Make text file	Creates a file consisting of the screen data in text file format.
Start monitor / Stop monitor	Selects whether or not the current values are monitored.
Execute test	Performs a test on the selected items. To select more than one item, select them while holding down the Ctrl key.
Close	Closes the screen that is currently open and returns to the previous screen.

REMARK

The following explains the selective test operation, using an example of writing to "Down Node Detection Inhibit Settings".

(1) Change the setting value field from "1 node" to "Do not detect".
Nothing is written to the QJ71DN91 at this point.

(2) Click the setting value field showing "1 node" to select.
To write more than one setting item at the same time, select multiple items while holding down the Ctrl key.

(3) Click Execute test to execute the write operation.

When the write operation is complete, the display in the current value field will change to "Do not detect".

6.6 Flash ROM Settings

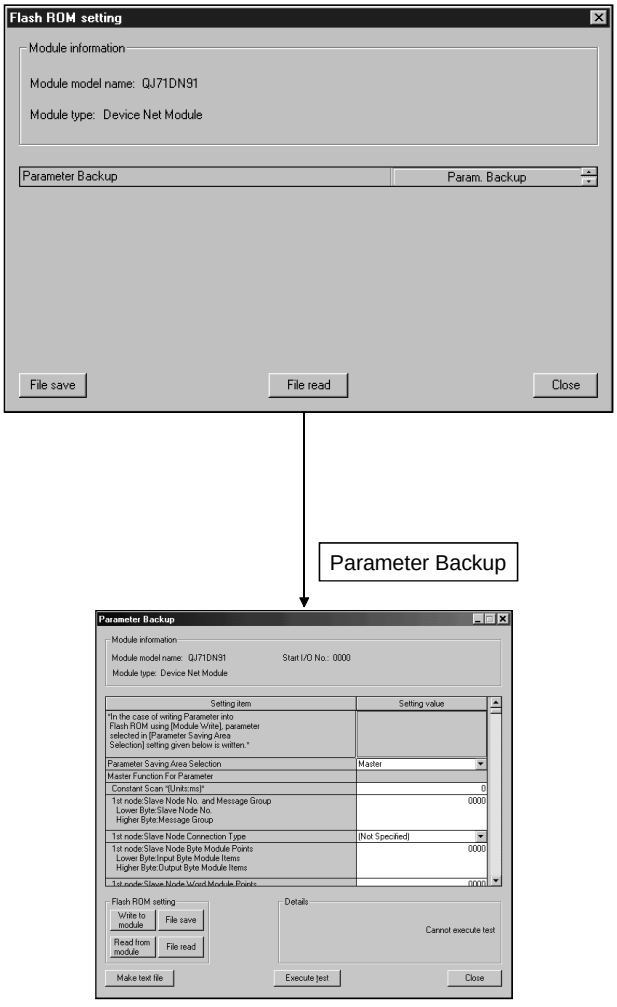
[Purpose of Setting]

The contents of flash ROM settings are edited offline.
The edited parameters can be written into the module on the "Parameter Backup" screen of "Monitor/Test".

[Startup procedure]

Flash ROM Setting screen → "Package name" → "Module model name" → Select

[Setting screen]



[Explanation of items]

(1) Description of screen display

Setting item : Displays the parameter names.
Setting (value) : Enter or select the value to be set in the flash ROM.

(2) Explanation of the command buttons

File save	Saves the parameters in the hard disk, etc.
File read	Reads the parameters saved in the hard disk, etc.
Close	Closes the screen that is currently open and returns to the previous screen.

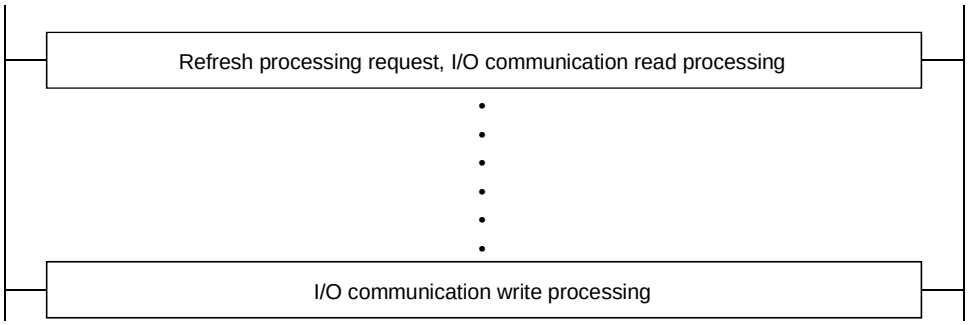
7 PROGRAMMING WHEN EXECUTING THE MASTER FUNCTION

This chapter explains programming when the master function is executed.

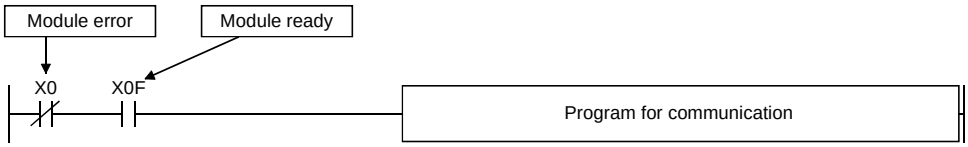
7.1 Precautions on Programming

This section explains the precautions when creating a program.

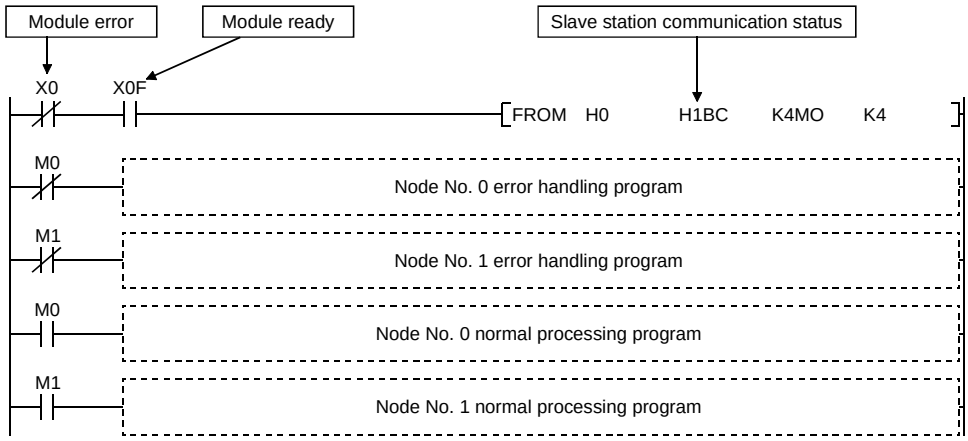
(1) Observe the following to perform input/output communication with a slave node.
- Place the I/O communication read processing program at the beginning of a sequence program.
- Place the I/O communication write processing program at the end of a sequence program.



(2) Perform the reading of reception data and the writing of transmission data only when there is no error in the module and the module is in the ready status.



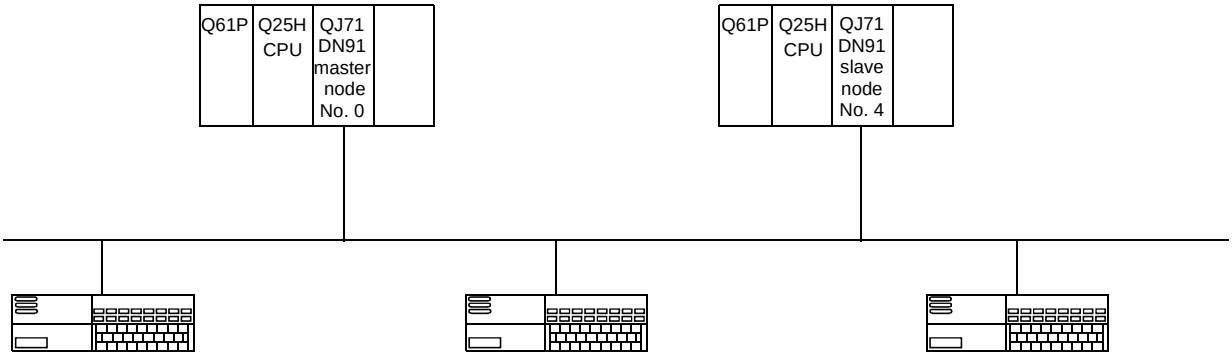
(3) Create a program that detects the communication status of each node and performs interlock. Also, create a program that handles errors when they occur.



7.2 System Configuration

The programs explains in this chapter are based on the following system configuration:

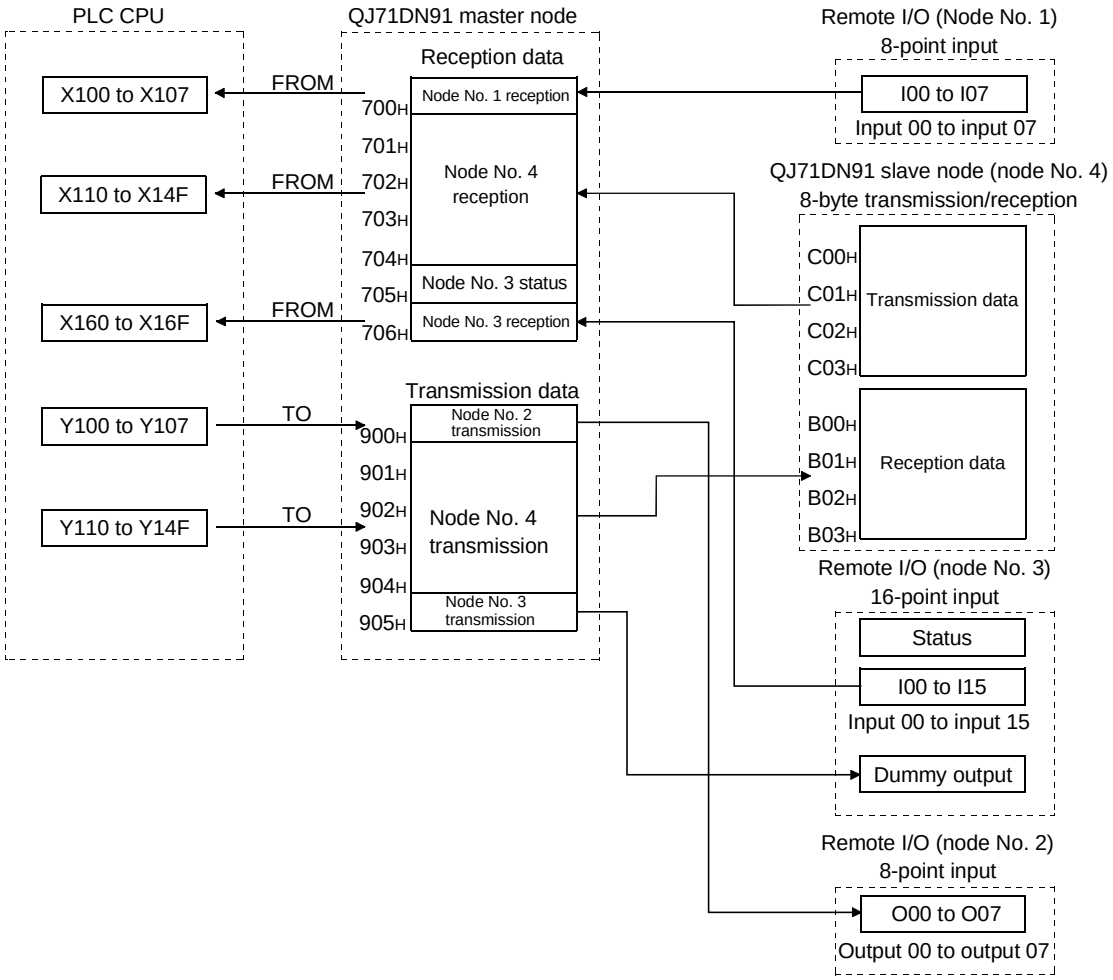
1) The QJ71DN91 (master node) is set to node number 0, the first remote I/O is set to node number 1, the second remote I/O is set to node number 2, the third QJ71DN91 (slave node) is set to node number 4, and the fourth remote I/O is set to node number 3.
2) The QJ71DN91 (master node) and the nodes numbered 1, 2 and 4 perform polling communication, and the QJ71DN91 (master node) and the node numbered 3 perform bit strobe communication.
3) Input data is assigned to X100 to X16F, and output data is assigned to Y100 to Y14F.
4) Each node's communication status is stored in M101 to M104.
5) When an error occurs, the system reads that error information into D500, then stores the node number of the error causing node into D501 and the error code into D502 separately.
6) The attribute data for message communication write is set in D30.
7) It is assumed that the QJ71DN91 (master node) is mounted in slot 0 of the basic base.



* The Flex I/O DeviceNet adapter by Rockwell Automation Japan has 2-byte input data as a status, as well as 2-byte input data and 2-byte output data.

7 - 2

The following shows the relationships among the PLC CPU, master node buffer memory and each slave node.

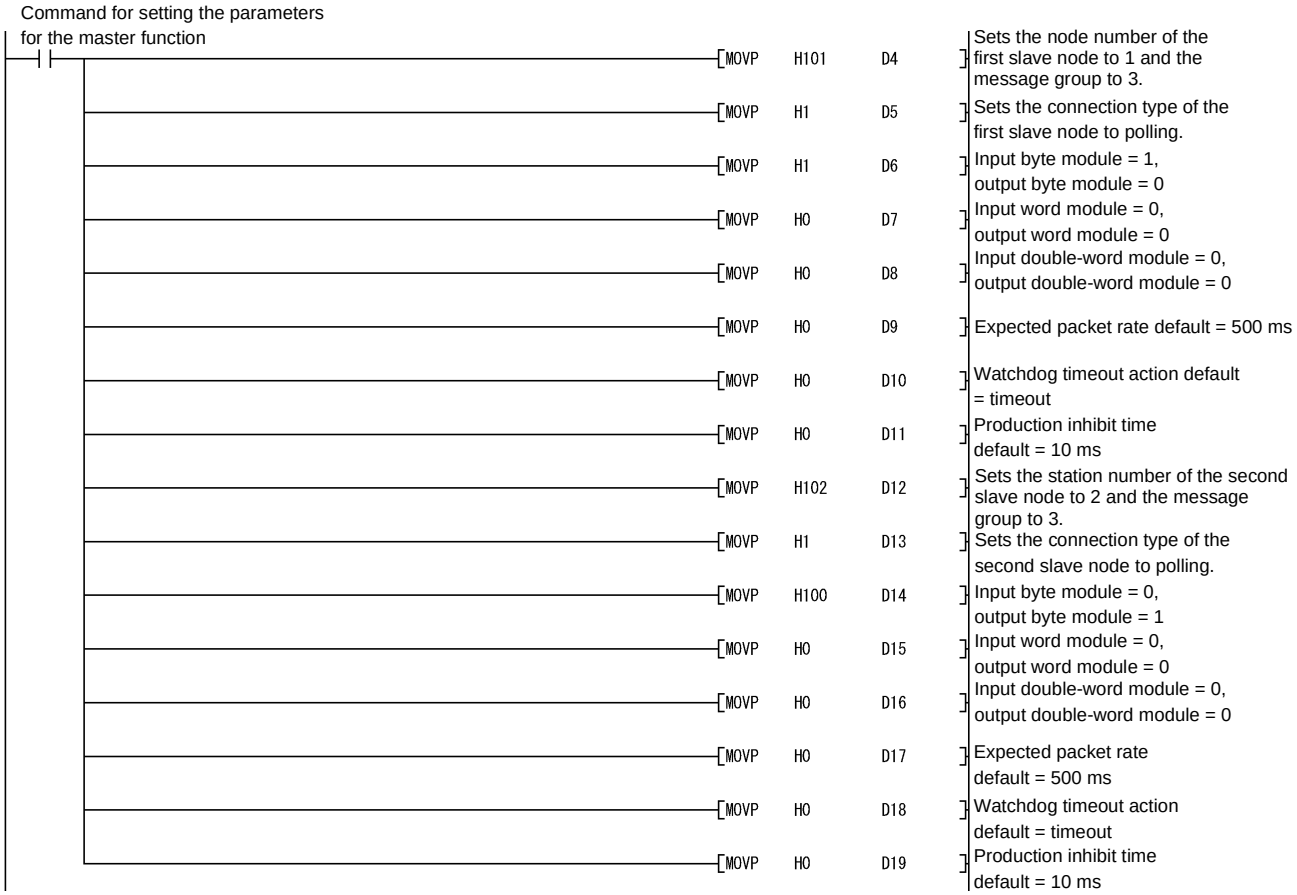


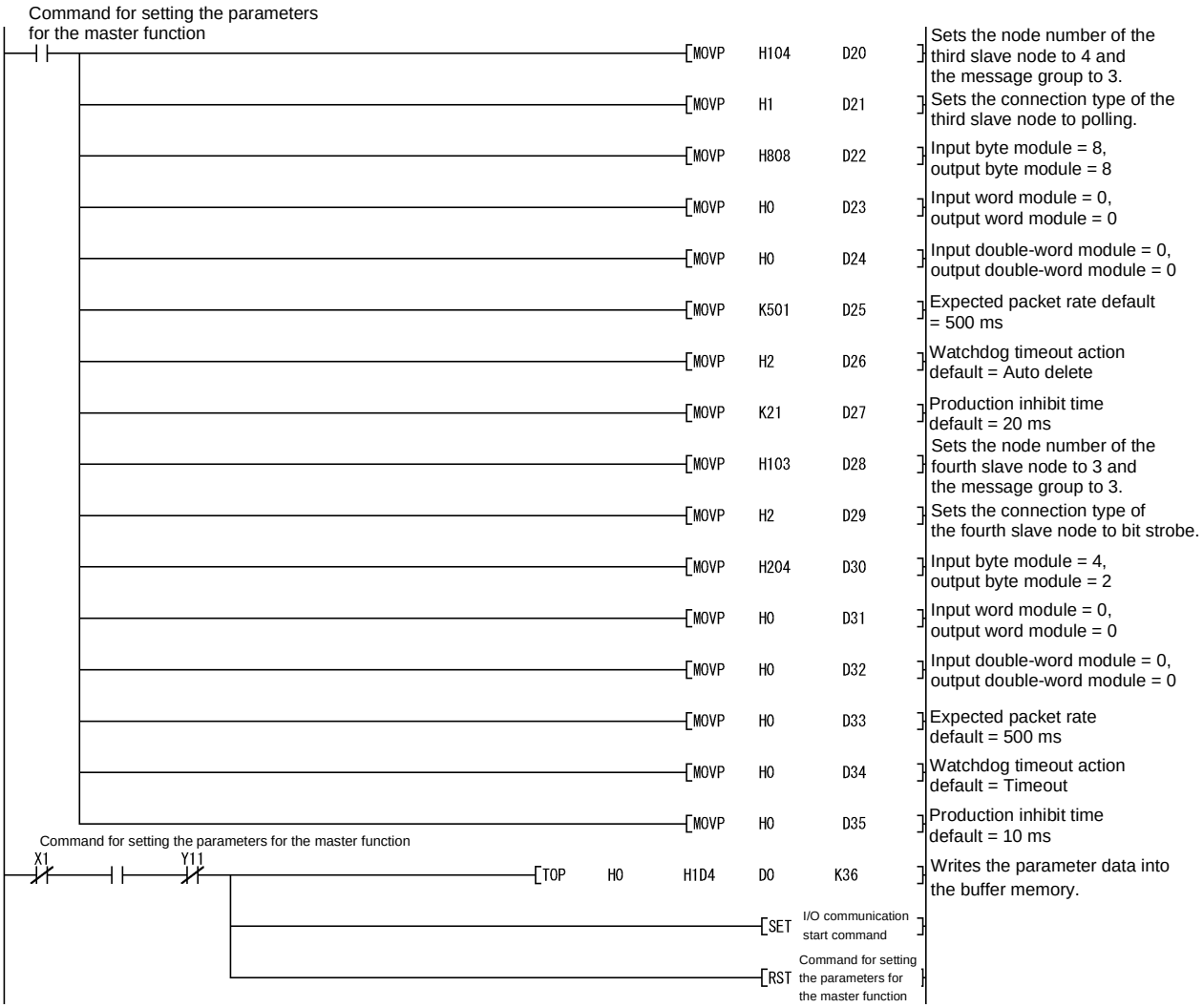
7.3 Setting Parameters

This section explains examples of program for setting parameters.
If GX Configurator-DN is used, the programs described in Section 7.3.1 through Section 7.3.3 will not be required.

7.3.1 Parameter settings using the sequence program

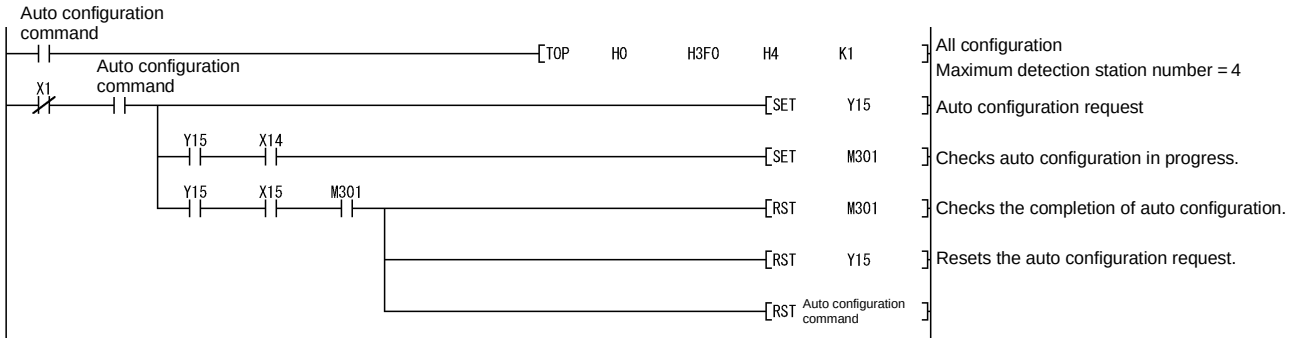
The following shows a method for setting parameters using the sequence program.




Command for setting the parameters for the master function
MOVP H104 D20
Sets the node number of the third slave node to 4 and the message group to 3.
MOVP H1 D21
Sets the connection type of the third slave node to polling.
MOVP H808 D22
Input byte module = 8, output byte module = 8
MOVP H0 D23
Input word module = 0, output word module = 0
MOVP H0 D24
Input double-word module = 0, output double-word module = 0
MOVP K501 D25
Expected packet rate default = 500 ms
MOVP H2 D26
Watchdog timeout action default = Auto delete
MOVP K21 D27
Production inhibit time default = 20 ms
MOVP H103 D28
Sets the node number of the fourth slave node to 3 and the message group to 3.
MOVP H2 D29
Sets the connection type of the fourth slave node to bit strobe.
MOVP H204 D30
Input byte module = 4, output byte module = 2
MOVP H0 D31
Input word module = 0, output word module = 0
MOVP H0 D32
Input double-word module = 0, output double-word module = 0
MOVP H0 D33
Expected packet rate default = 500 ms
MOVP H0 D34
Watchdog timeout action default = Timeout
MOVP H0 D35
Production inhibit time default = 10 ms
Command for setting the parameters for the master function
X1
Y11
TOP H0 H1D4 D0 K36
Writes the parameter data into the buffer memory.
SET I/O communication start command
RST Command for setting the parameters for the master function

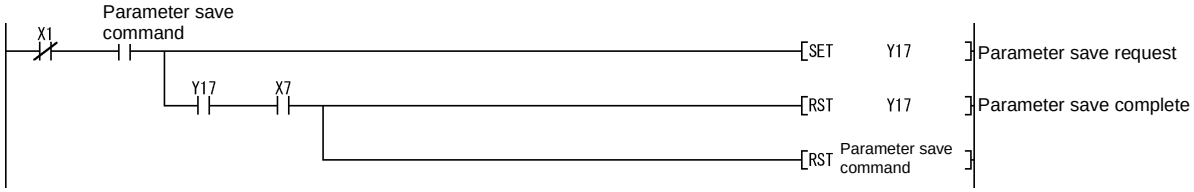
7.3.2 Creating parameters using auto configuration

The following explains a method for creating parameters using auto configuration.



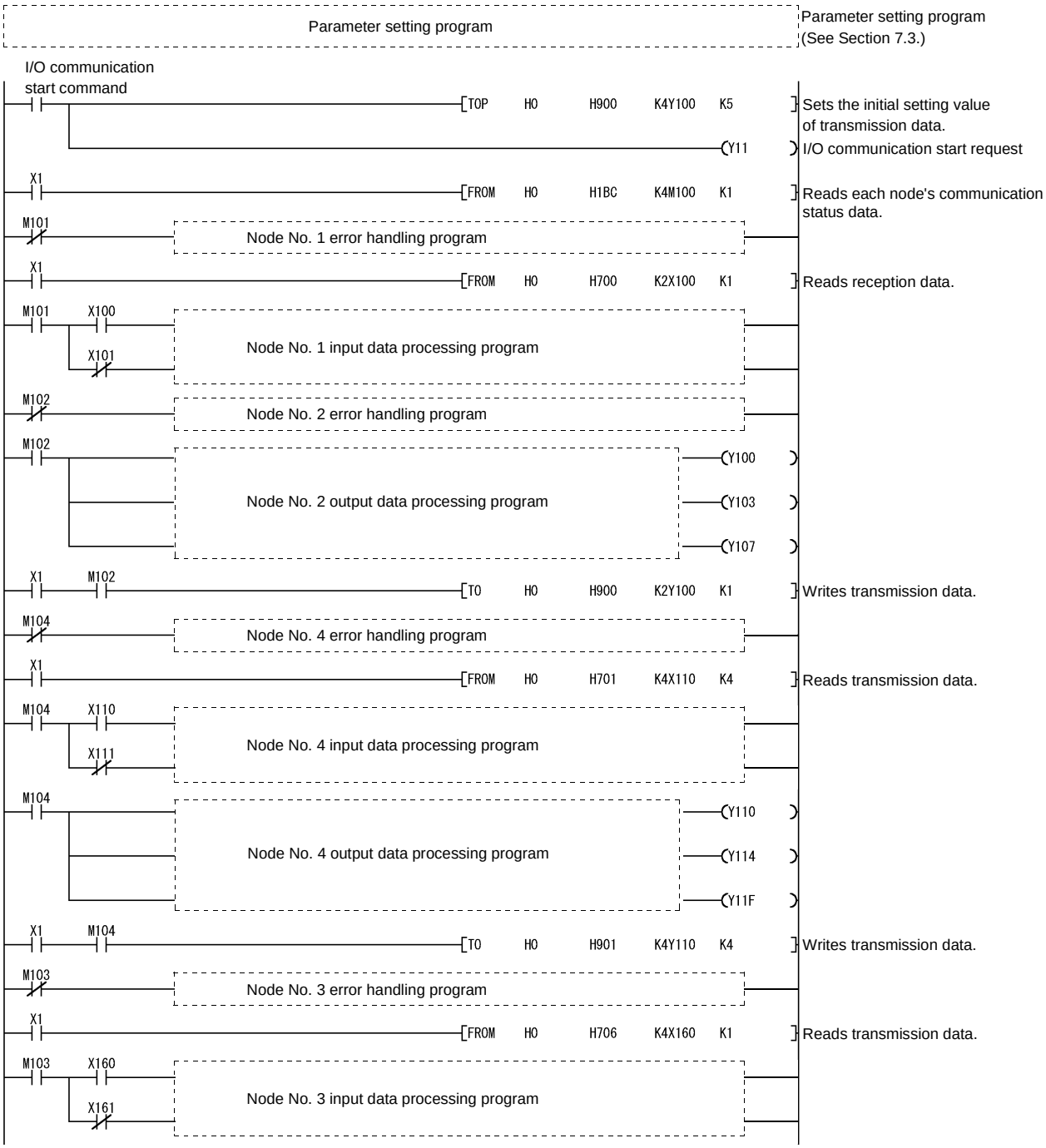
7.3.3 Saving parameters in flash ROM

The following explains a method for saving parameters in flash ROM.
Once parameters are saved, it is not necessary to save them again until they are changed.



7.4 I/O Communication with Slave Nodes

This section explains an example of a sequence program that performs I/O communication.
If GX Configurator-DN is used, the FROM and TO instructions are not required.

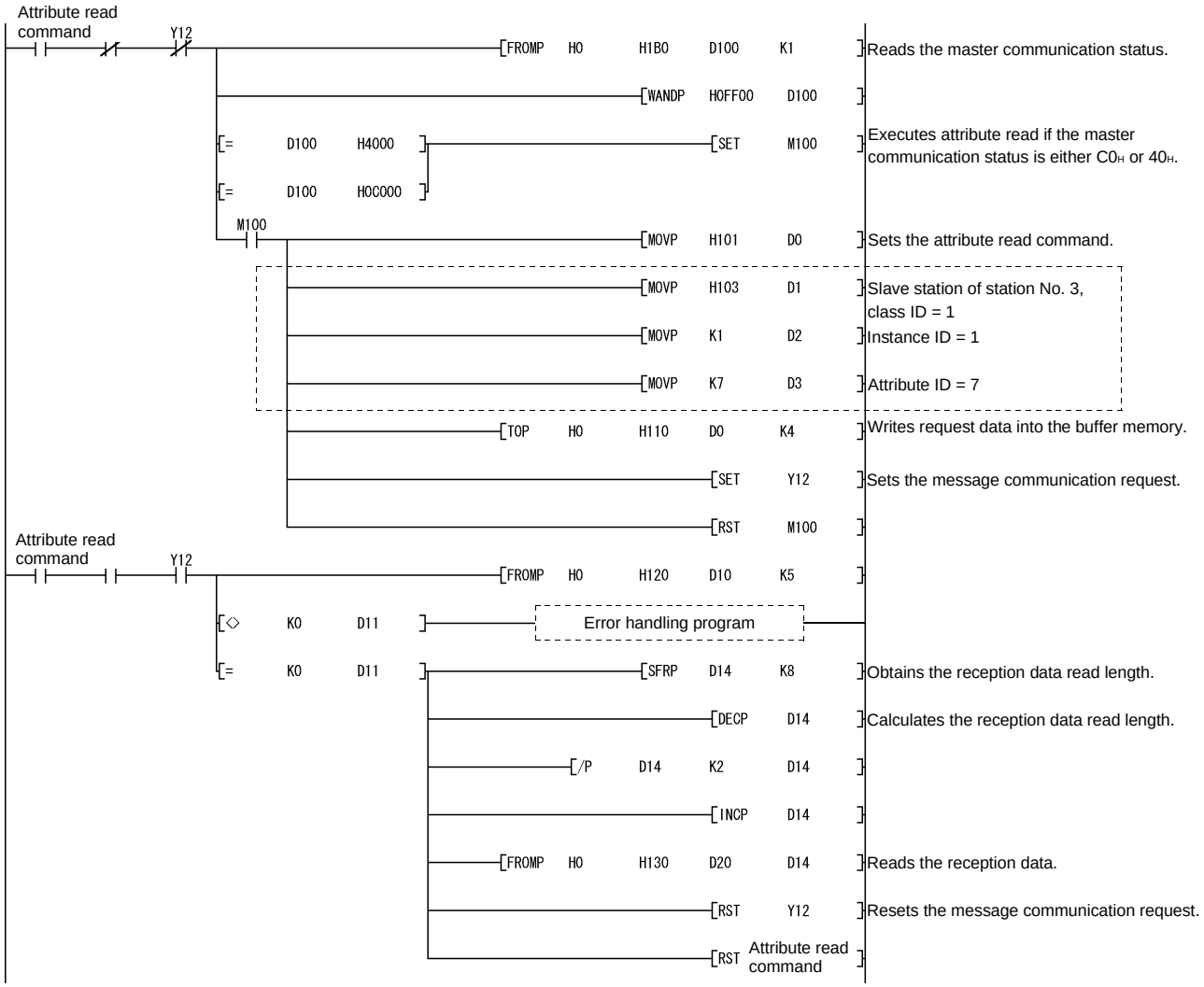


7.5 Performing Message Communication

This section explains an example of a sequence program that performs message communication.

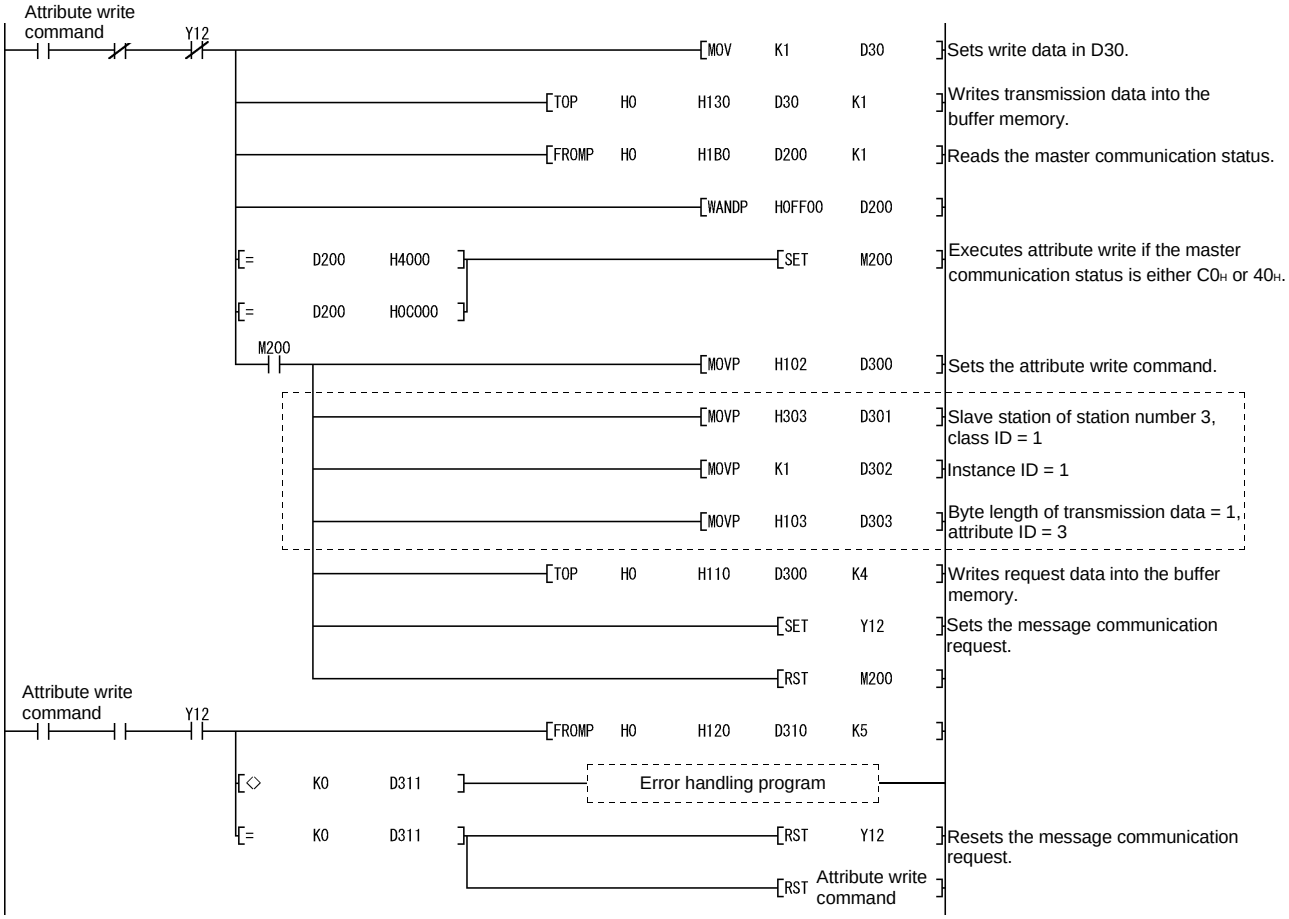
7.5.1 Example of message communication read

The following shows an example of a sequence program that reads attributes from node number 3.
In sections enclosed with a dashed line, the area that is actually read and written as well as the class ID, instance ID and attribute ID are different depending on the slave node. Therefore, refer to the applicable manual of the slave node.



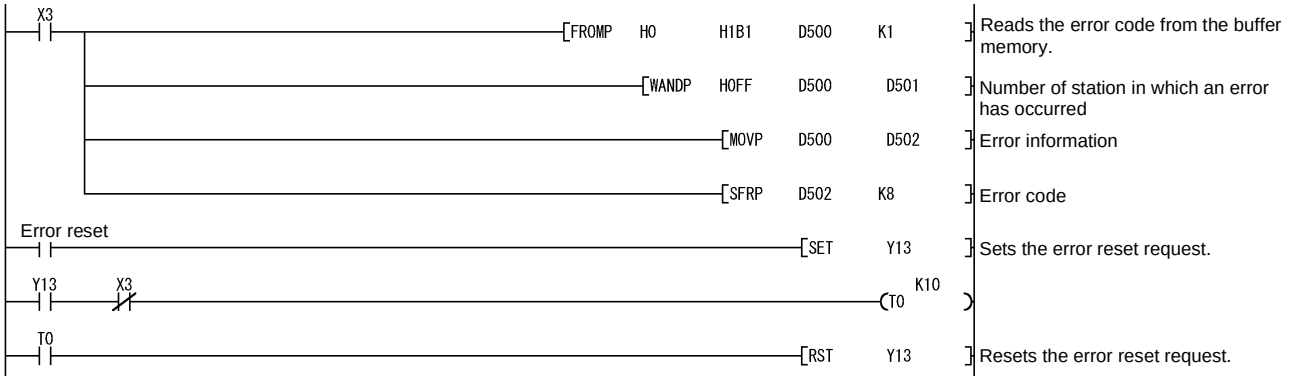
7.5.2 Example of message communication write

The following shows an example of a sequence program that writes attributes to node number 3.
In sections enclosed with a dashed line, the area that is actually read and written as well as the class ID, instance ID and attribute ID are different depending on the slave node. Therefore, refer to the applicable manual of the slave node.



7.6 Obtaining Error Information

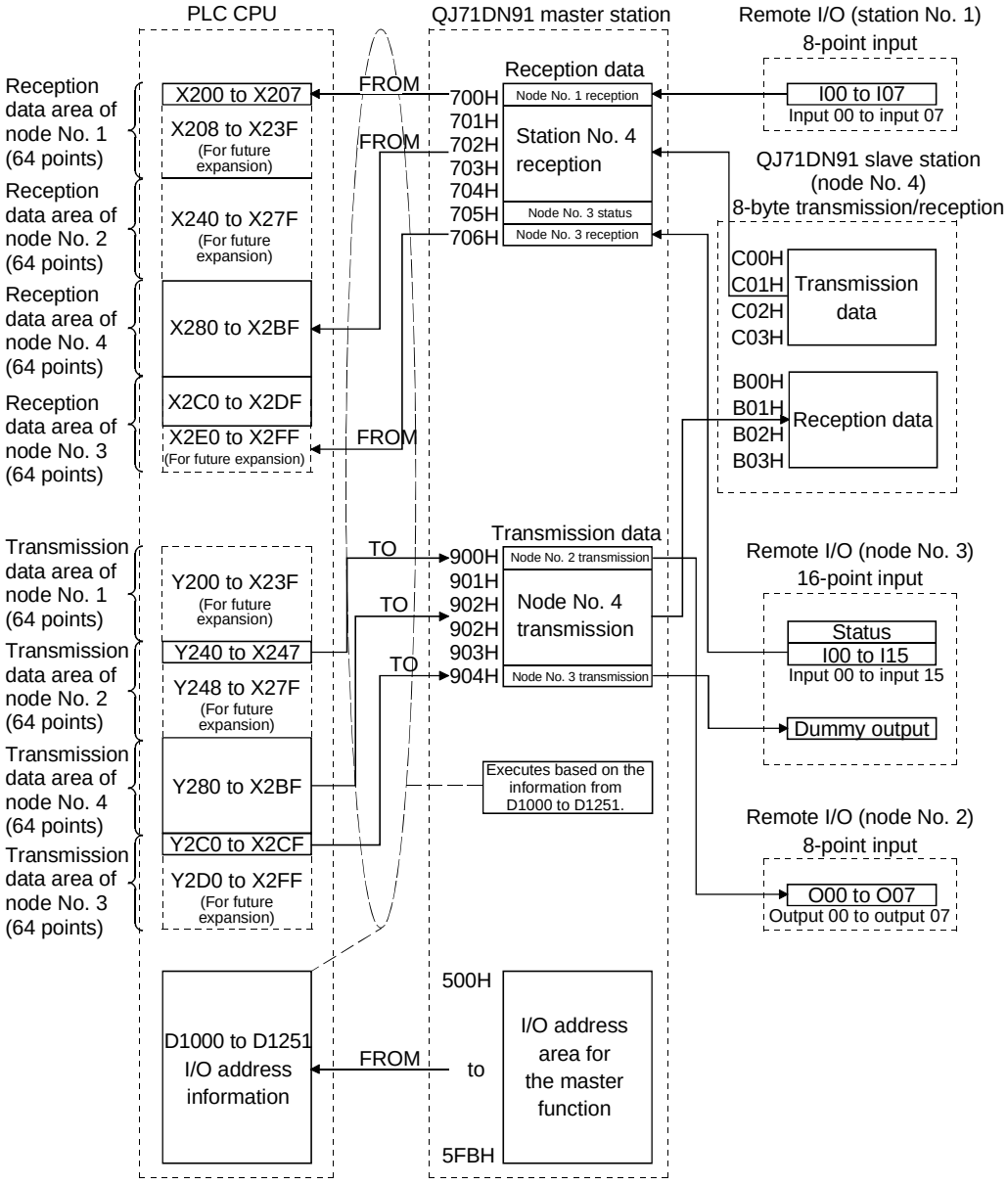
This section explains an example of a sequence program that obtains the error information for the master function.



7.7 Allocating Transmission/Reception Data Storage Devices for Future Expansion

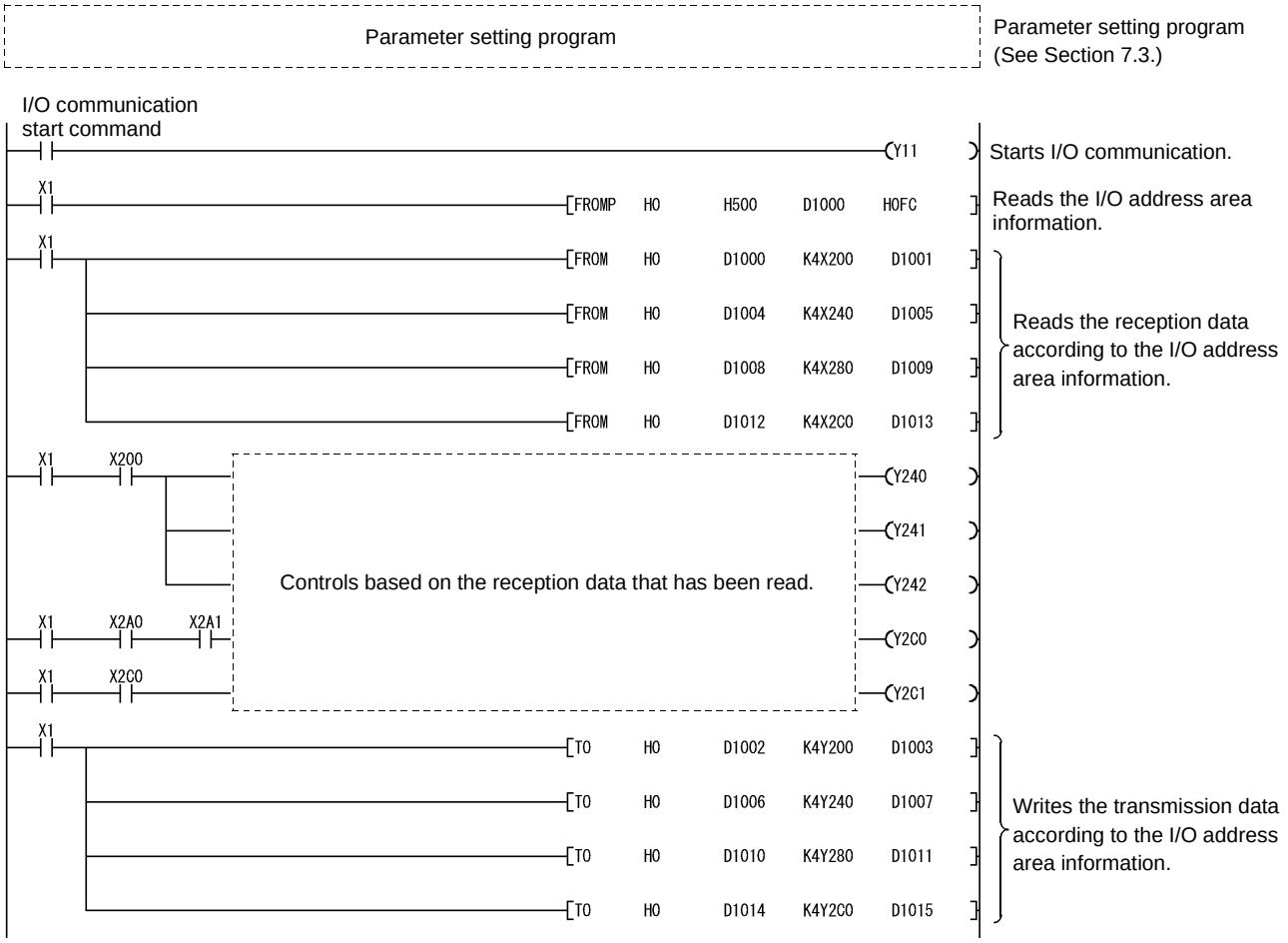
If the transmission/reception data of each slave node varies depending on the system, it is necessary to change the sequence program when the transmission/reception data length changes. However, this can be avoided by allocating a transmission/reception data storage device for each node, using the I/O address area information for the master function in the buffer memory, and executing the FROM and TO instructions.

The following figure shows an example that allocates a transmission/reception data storage device for each node at every fixed 64 points, using the same system configuration described in Section 7.2. In this example, the reception data storage device of node number 1 is allocated for 64 points from X200, the reception data storage device of node number 2 is allocated for 64 points from X240, and so on. The I/O address area information for the master function is stored from D1000 to D1251, and the FROM and TO instructions are executed while using the read and write starting addresses of the buffer memory of this information and the data length.



7 - 11

The following explains an example of the sequence program used in this case.



8 PROGRAMMING WHEN EXECUTING THE SLAVE FUNCTION

This chapter explains programming when the slave function is executed.

8.1 System Configuration

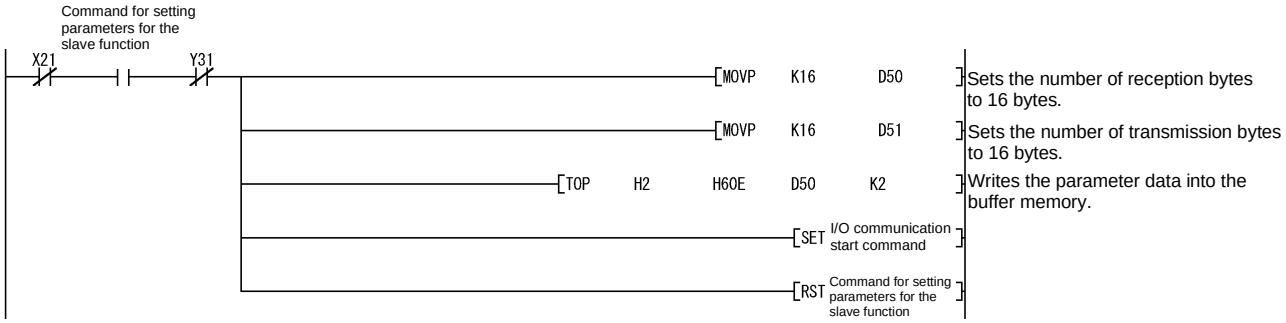
The programs explained in this chapter are based on the following system configuration:

1) The reception data is allocated from X200 to X27F, and the transmission data is allocated from Y200 to Y27F.
2) If an error occurs, the error information is read to D500.
3) It is assumed that the QJ71DN91 (slave node) is mounted in slot 0 of the basic base.

8 - 1

8.2 Setting Parameters Using the Sequence Program

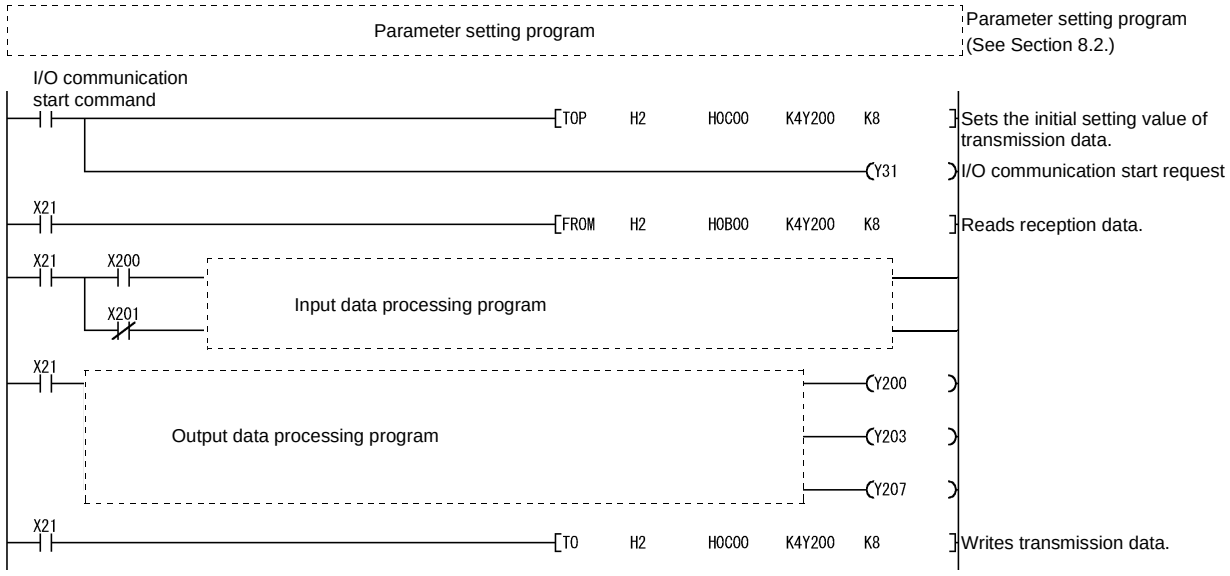
This section explains an example of a sequence program for setting parameters.



8 - 2

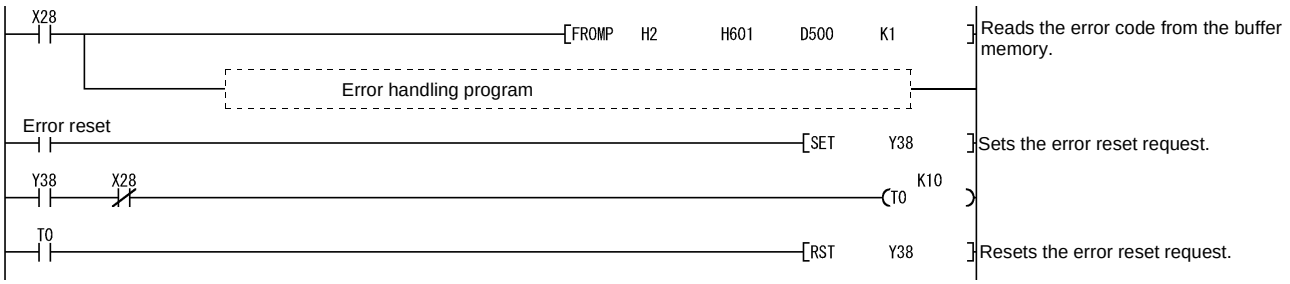
8.3 I/O Communication with the Master Node

This section explains an example of a sequence program that performs I/O communication with the master node.



8.4 Obtaining Error Information

This section explains an example of a sequence program that obtains the error information for the slave function.



9 TROUBLESHOOTING

This chapter explains the contents of errors that may occur while using the QJ71DN91 as well as their troubleshooting procedures.

This chapter consists of the following two sections:

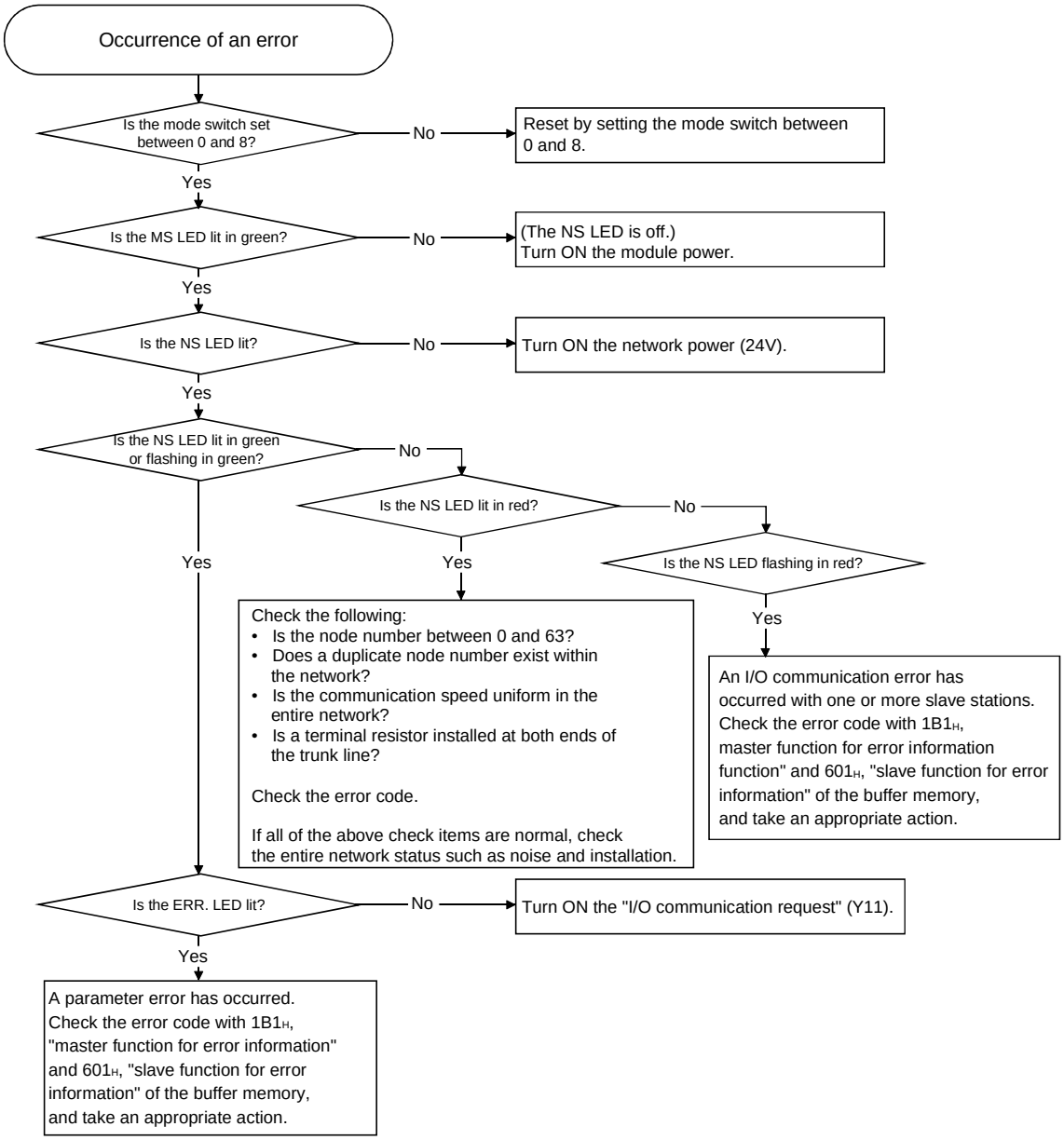
Section 9.1 Items to Check When an Error Occurs
Shows troubleshooting procedures based on the phenomenon of errors.
Section 9.2 Error Codes
Shows the action to be taken based on the error codes.

9 - 1

9.1 Items to Check When an Error Occurs

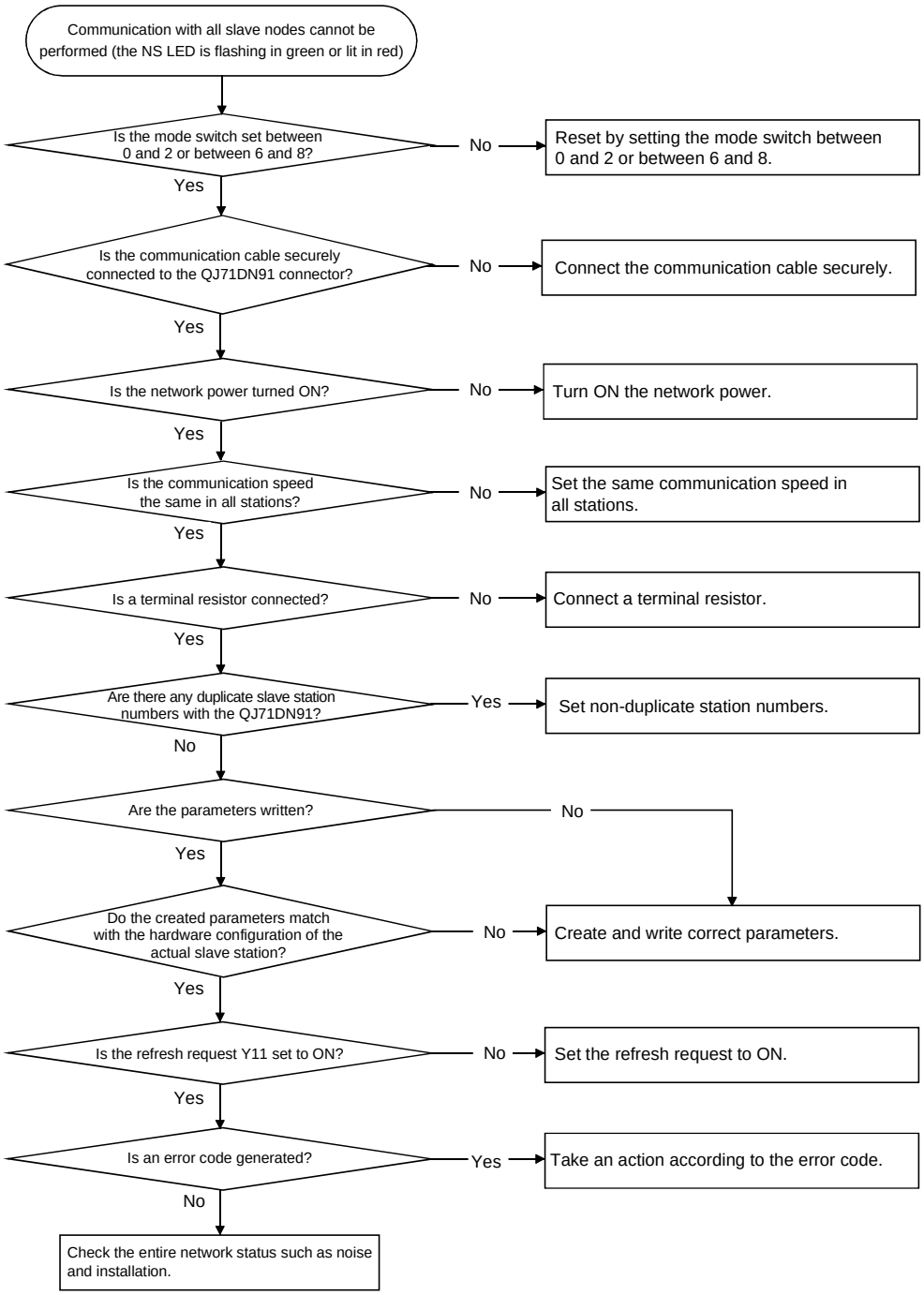
This section explains the items to check when an error occurs and its troubleshooting procedure:

9.1.1 Checking the LEDs

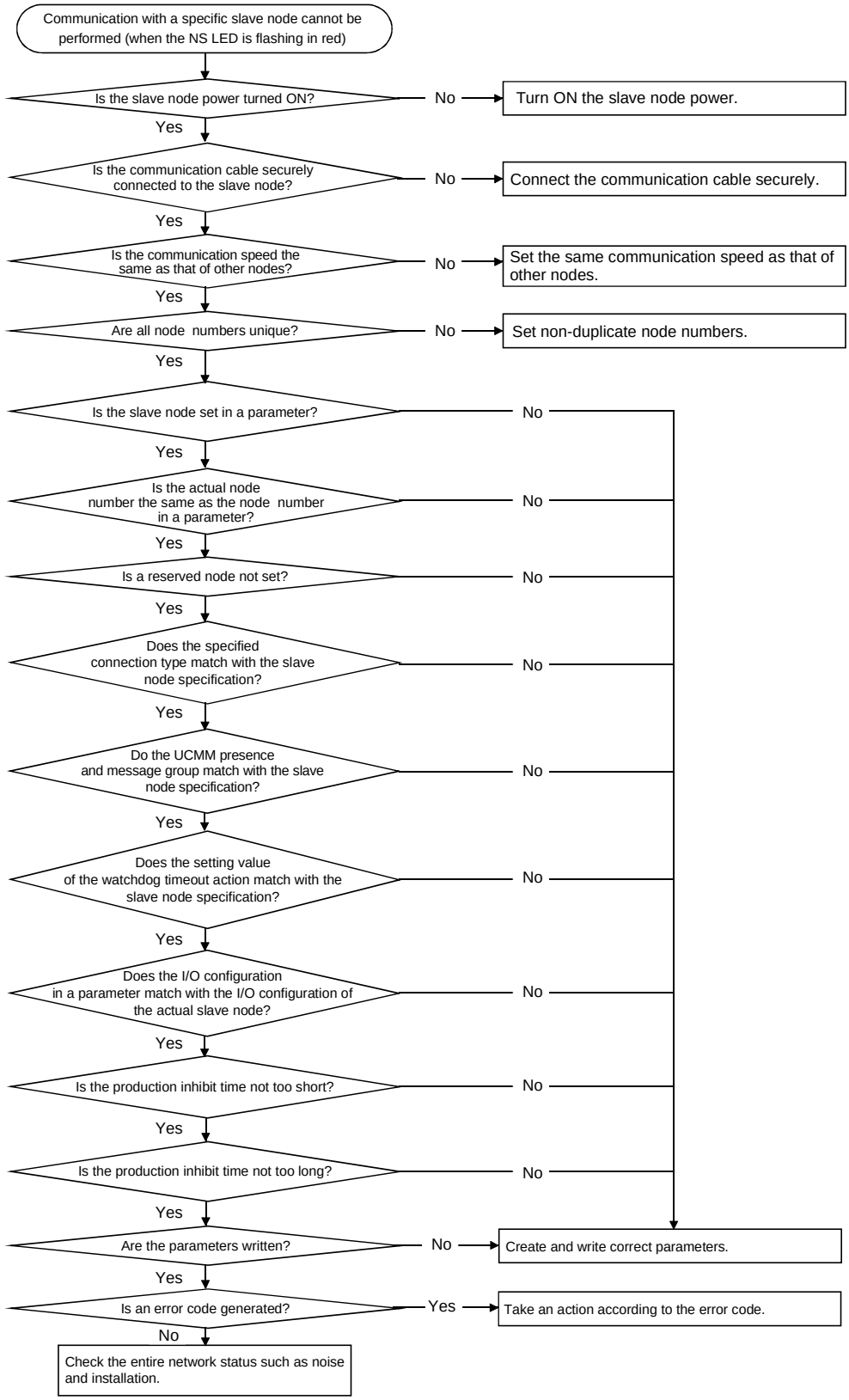


9 - 2

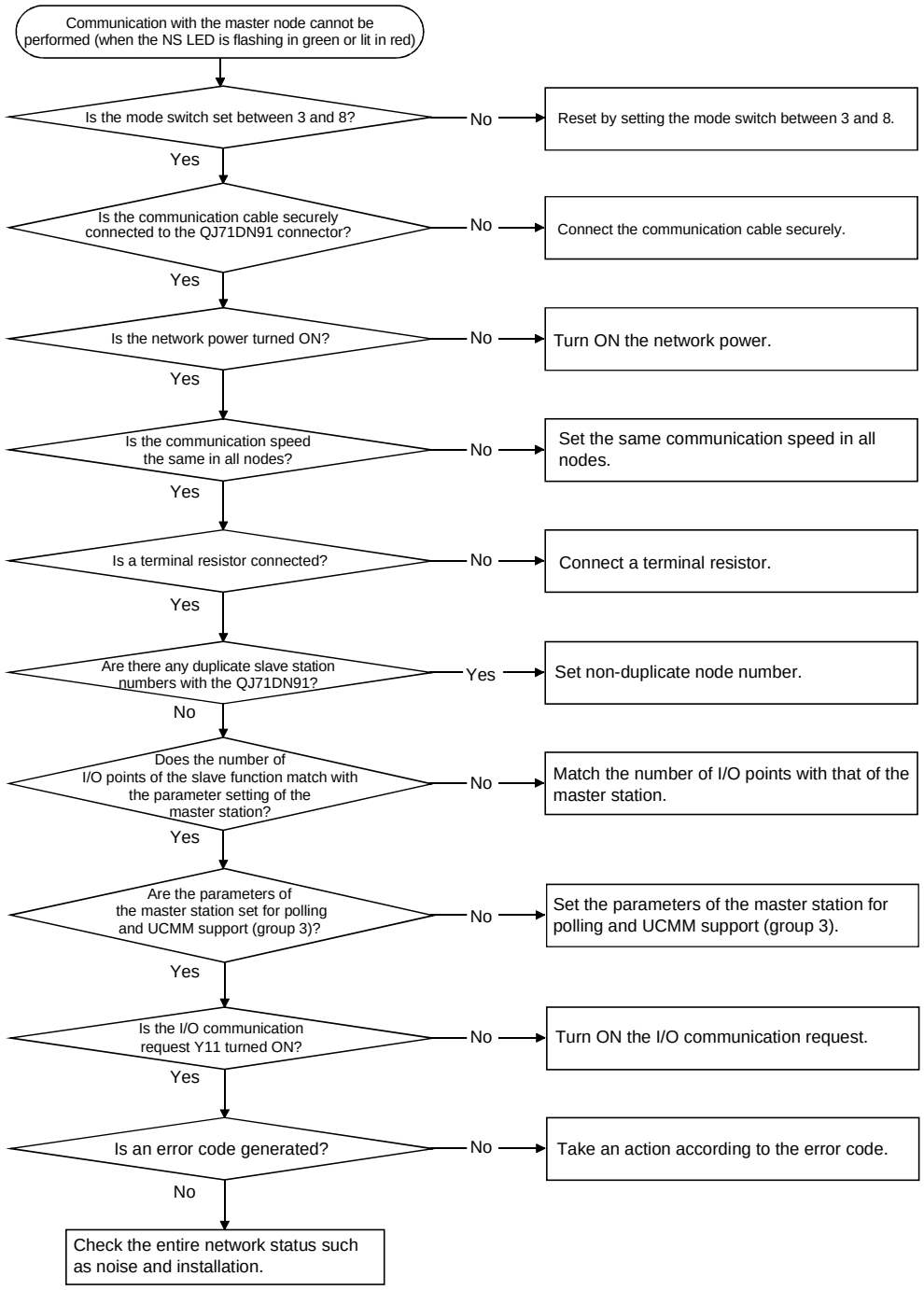
9.1.2 When communication with all slave nodes cannot be performed (using the master function)



9.1.3 When communication with a specific slave node cannot be performed (using the master function)



9.1.4 When communication with the master node cannot be performed (using the slave function)



9.2 Error Codes

This section explains the contents of error codes and actions to be taken.
Error codes are classified into the communication error codes and the execution error codes during message communication.

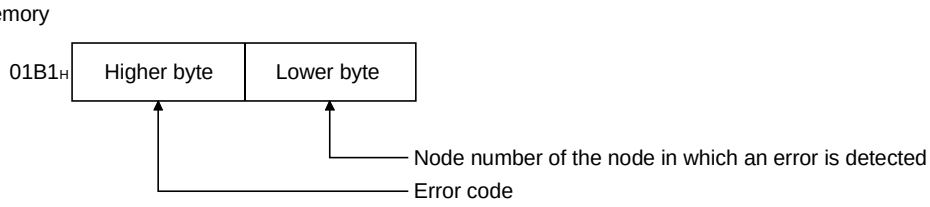
(1) As for the communication error codes, read them when either the master function for error set signal (X03) or the slave function for error set signal (X08) is turned ON, and check the contents of the errors.

(2) As for the message communication execution error codes, read them when the message communication completion (X02) is turned ON, and check the contents of the errors.

9.2.1 Communication error codes

The error information is stored in buffer memory address 01B1H when the master function is used, and is stored in buffer memory address 0601H when the slave function is used. It is separated into the higher byte and lower byte.
Higher byte: Error code
Lower byte: Node number of the node in which an error is detected

Buffer memory



(1) When the error-detected node number (lower byte of error information) is FFH

Error code (HEX.)	Error detection	Description	Corrective action	Detection time period	
				Master function	Slave function
36H	QJ71DN91	The value of the local node number (MAC ID) is out of range. The value of the mode switch is out of range.	• Set the local node number between 0 and 63. • Set the mode switch to other than D and E.	○	○
39H	QJ71DN91	Two or more nodes that have the same node number (MAC ID) exist in the network.	• Set non-duplicate node numbers.	○	○
E0H	QJ71DN91	Network power is not being supplied.	• Supply the network power (24V DC).	○	○
E1H	QJ71DN91	Other modules are not found in the network.	• Connect other modules in the network.	○	○
F0H	QJ71DN91	Node number setting switch or mode switch setting was changed during operation.	• Return the node number setting switch or mode switch setting to the original setting.	○	○

(2) When the error-detected node number (lower byte of error information) is FEH

Error code (HEX.)	Error detection	Description	Corrective action	Detection time period	
				Master function	Slave function
02H	QJ71DN91	The number of input points and output points of the slave node set by parameters are both 0.	• Set the number of input points and output points according to the slave node specifications.	○	×
03H	QJ71DN91	The lower byte of the slave node number in the buffer memory is out of range.	• Set it between 0 and 63.	○	×
04H	QJ71DN91	The higher byte of the slave node number in the buffer memory is out of range.	• Set it between 01H and 04H, or to 80H.	○	×
05H	QJ71DN91	The connection type in the buffer memory is out of range.	• Set it to one of the following: 0001H, 0002H, 0004H or 0008H	○	×
06H	QJ71DN91	A slave node having the same node number as the node number of the local node is set in the buffer memory.	• Set non-duplicate node numbers in all nodes.	○	×

Error code (HEX.)	Error detection	Description	Corrective action	Detection time period	
				Master function	Slave function
07H	QJ71DN91	No slave node has been set.	• Set at least one slave node.	○	×
08H	QJ71DN91	The total input data length of all slave nodes is too long.	• Reduce the total input data length of all slave nodes to 512 bytes or less.	○	×
09H	QJ71DN91	The total output data length of all slave nodes is too long.	• Reduce the total output data length of all slave nodes to 512 bytes or less.	○	×
0AH	QJ71DN91	The watchdog timeout action value in a parameter is invalid.	• Set it to one of the following: 0000H, 0001H, 0002H or 0003H	○	×
0BH	QJ71DN91	The expected packet rate value in the buffer memory is smaller than the production inhibit time value.	• Change the value so that•the expected packet rate value is greater than or equal to the production inhibit time value.	○	×
0CH	QJ71DN91	Flash ROM checksum error (parameter area for the master function)	• Save the parameters again. • Do not turn OFF the power or reset while saving the parameters.	○	○
0DH	QJ71DN91	Flash ROM checksum error (parameter area for the slave function)	• Save the parameters again. • Do not turn OFF the power or reset while saving the parameters.	○	○
0EH	QJ71DN91	Flash ROM checksum error (auto communication start setting area)	• Save the parameters again. • Do not turn OFF the power or reset while saving the parameters.	○	○
0FH	QJ71DN91	Flash ROM all clear error	• Clear all parameters again. • Do not turn OFF the power or reset while clearing all parameters.	○	○
10H	QJ71DN91	The number of input points per slave node has exceeded 256 bytes.	• Correct the number of input points per slave node to 256 bytes or less.	○	×
11H	QJ71DN91	The number of output points per slave node has exceeded 256 bytes.	• Correct the number of output points per slave node to 256 bytes or less.	○	×
15H	QJ71DN91	The production inhibit time value was set to 0 ms (setting value 1) in cyclic.	• Set the production inhibit time value to a value other than 0 ms.	○	×
16H	QJ71DN91	Slave nodes that were set by parameters are all reserved nodes.	• Set the parameters according to the slave nodes connected to the network.	○	×
80H	QJ71DN91	The number of reception bytes of the slave function is out of range.	• Set it within the range between 0 and 128 bytes.	×	○
81H	QJ71DN91	The number of transmission bytes of the slave function is out of range.	• Set it within the range between 0 and 128 bytes.	×	○
81H	QJ71DN91	The numbers of transmission bytes and reception bytes of the slave function are both set to 0.	• Set either the number of transmission bytes or the number of reception bytes to a value other than 0.	×	○
A0H	QJ71DN91	The numbers of I/O points of both the master and slave functions were set to 0 when both the master and slave functions were used.	• Set the number of I/O points of the slave node in a master function parameter. • Set the number of transmission/reception bytes in a slave function parameter. (Be sure to set either the master function or slave function.)	○	○

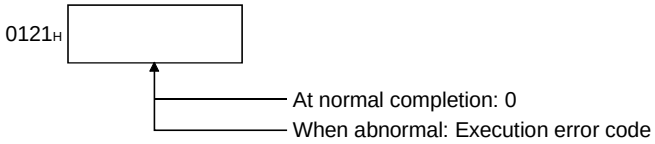
(3) when the error-detected node number (lower byte of error information) is other than FF$_H$ and FE$_H$

Error code (HEX.)	Error detection	Description	Corrective action	Detection time period	
				Master function	Slave function
01$_H$	QJ71DN91	A network problem was detected after communication was started.	• Check that the cable is connected correctly.	○	○
1E$_H$	QJ71DN91	Slave node did not respond.	• Check the entire network and slave node statuses such as whether or not the MAC ID and baud rate are set correctly, a slave node is down, or a terminal resistor is disconnected.	○	×
20$_H$	Slave node	Slave node responded with a non-prescribed error.	• Read the communication error information, and take an appropriate action according to the error information.	○	×
23$_H$	Slave node	Slave node responded with an error when establishing a connection.	• Read the communication error information, and take an appropriate action according to the error information.	○	×
24$_H$	QJ71DN91	The input data size of a parameter is different from the size of the actual slave node.	• Check the slave node manual and set the correct input data size.	○	×
25$_H$	QJ71DN91	The output data size of a parameter is different from the size of the actual slave node.	• Check the slave node manual and set the correct output data size.	○	×
26$_H$	QJ71DN91	Response data of a function that is not supported by the QJ71DN91 was received.	• Check the slave node manual, and change the setting so that any data of functions not supported by the QJ71DN91 will not be sent by the slave node. • Check the entire network and slave node statuses such as whether or not a terminal resistor is disconnected.	○	×
27$_H$	Slave node	The connection is set to the mode that was already specified.	• Check the entire network and slave node statuses such as whether or not a terminal resistor is disconnected.	○	×
28$_H$	QJ71DN91	Unexpected invalid data was received when establishing a connection.	• Check the entire network and slave node statuses such as whether or not a terminal resistor is disconnected.	○	×
29$_H$	Slave node	Connection has already been established with that slave node.	• Wait a while, and reset the slave node if the connection cannot be established.	○	×
2A$_H$	QJ71DN91	The data length of a polling response is different from the data length read from the slave node when establishing a connection.	• Check the entire network and slave node statuses such as whether or not a terminal resistor is disconnected.	○	×
2B$_H$	QJ71DN91	The first division data was received twice in the division reception of a polling response.	• Check the entire network and slave node statuses such as whether or not a terminal resistor is disconnected.	○	×
2C$_H$	QJ71DN91	The received division data number is different from the expected number in the division reception of a polling response.	• Check the entire network and slave node statuses such as whether or not a terminal resistor is disconnected.	○	○
2D$_H$	QJ71DN91	Intermediate data or last data was received before receiving the first division data in the division reception of a polling response.	• Check the entire network and slave node statuses such as whether or not a terminal resistor is disconnected.	○	○
3B$_H$	QJ71DN91	Two or more identical node numbers (MAC IDs) were detected in parameters.	• Two or more slave nodes having the same node number are set in the parameters. Set the correct node numbers. • A slave node having the same node number as that of the local node exists in the parameters.	○	○
47$_H$	QJ71DN91	Incorrect connection type was specified.	• Check that the connection type value is correct. • Read the communication error information, and take an appropriate action according to the error information.	○	×
80$_H$	QJ71DN91	Timeout occurred during the polling connection of the slave function.	• Check the entire network and slave node statuses such as whether or not a terminal resistor is disconnected. • Check the master node status.	×	○
81$_H$	QJ71DN91	A connection other than explicit messages and polling was allocated.	• Do not allocate I/O connections other than polling.	×	○
82$_H$	QJ71DN91	The number of reception bytes of polling is greater than the maximum number of reception points.	• Match the I/O point setting of the master node with that of the QJ71DN91.	×	○

9.2.2 Execution error codes of message communication (using the master function only)

The execution error codes are stored in buffer memory address 0121H.
At normal end: 0
When abnormal: Execution error code

Buffer memory



(1) When reading the communication error information

Error code (Dec.)	Error detection	Description	Corrective action
161	QJ71DN91	The specified slave node number is other than 0 to 63.	• Specify a slave node number between 0 and 63.

(2) When reading/writing/resetting attributes

Error code (Dec.)	Error detection	Description	Corrective action
2	Slave node	The object could not use the resource required to execute the requested service.	• Referring to the slave node manual, check the condition under which the slave node notifies this error, and take an appropriate action.
8	Slave node	The requested service was not installed, or it was not defined for this object class/instance.	• Check whether or not the specified MAC ID, class ID, instance ID and attribute ID are correct. • Referring to the slave node manual, check the condition under which the slave node notifies this error, and take an appropriate action.
9	Slave node	Invalid attribute data was detected.	• Check whether or not the specified MAC ID, class ID, instance ID and attribute ID are correct. • Referring to the slave node manual, check the condition under which the slave node notifies this error, and take an appropriate action.
11	Slave node	The object is already placed in the mode/status that is requested by the service.	• Check whether or not the specified MAC ID, class ID, instance ID and attribute ID are correct. • Verify the current status by reading attributes. • Referring to the slave node manual, check the condition under which the slave node notifies this error, and take an appropriate action.
12	Slave node	The object cannot execute the requested service in the current mode/status.	• Check whether or not the specified MAC ID, class ID, instance ID and attribute ID are correct. • Verify the current status by reading attributes. • Referring to the slave node manual, check the condition under which the slave node notifies this error, and take an appropriate action.
14	Slave node	A request to change an attribute whose change is inhibited was received.	• Check whether or not the specified MAC ID, class ID, instance ID and attribute ID are correct. • Referring to the slave node manual, check the condition under which the slave node notifies this error, and take an appropriate action.
15	Slave node	Permission/privilege check failed.	• Check whether or not the specified MAC ID, class ID, instance ID and attribute ID are correct. • Referring to the slave node manual, check the condition under which the slave node notifies this error, and take an appropriate action.
16	Slave node	The requested service cannot be executed in the current device status.	• Check whether or not the specified MAC ID, class ID, instance ID and attribute ID are correct. • Referring to the slave node manual, check the condition under which the slave node notifies this error, and take an appropriate action.
17	QJ71DN91	Slave node did not respond.	• Check the entire network and slave node statuses such as whether or not a slave node is down or a terminal resistor is disconnected.

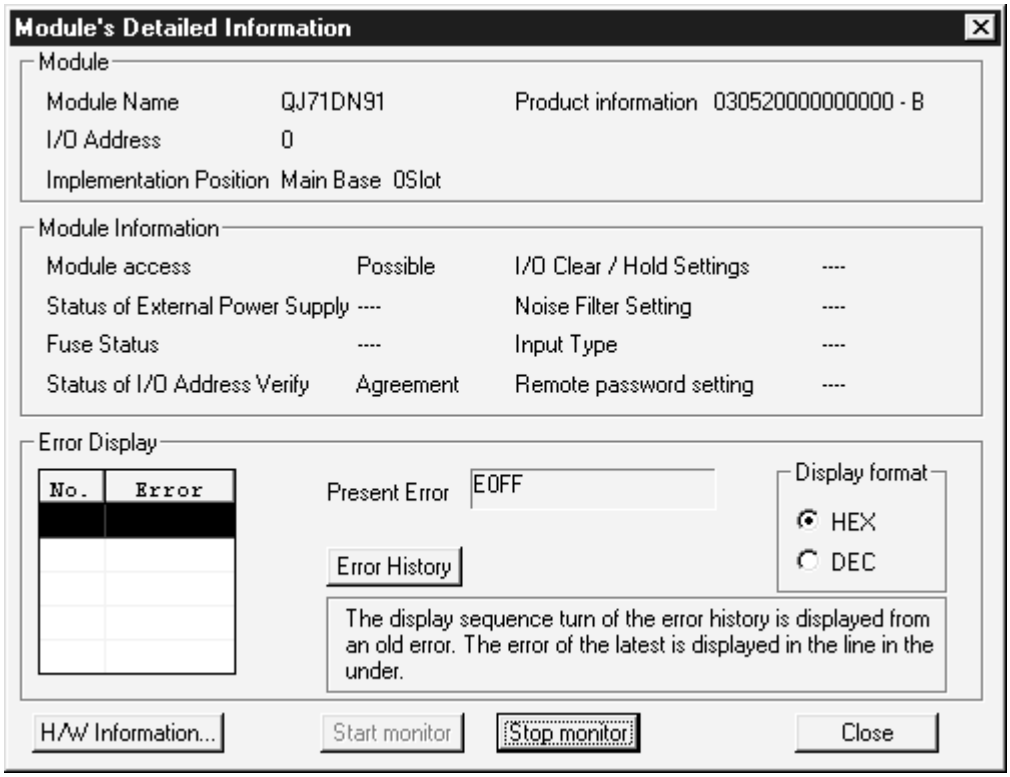
Error code (Dec.)	Error detection	Description	Corrective action
19	Slave node	Sufficient data to execute the specified operation was not provided.	• Check that the specified MAC ID, class ID, instance ID and attribute ID are correct. • In case of attribute write, verify that the specified data is sufficient and the data length is correct. • Referring to the slave node manual, check the condition under which the slave node notifies this error, and take an appropriate action.
20	Slave node	The specified attribute is not supported.	• Check that the specified MAC ID, class ID, instance ID and attribute ID are correct. • Referring to the slave node manual, check the condition under which the slave node notifies this error, and take an appropriate action.
21	Slave node	The service provided excessive data.	• Set the data to be returned by the slave node to 240 bytes or less.
22	Slave node	The specified object does not exist in a slave node.	• Check that the specified MAC ID, class ID, instance ID and attribute ID are correct. • Referring to the slave node manual, check the condition under which the slave node notifies this error, and take an appropriate action.
50	QJ71DN91	The response data format is invalid.	• Check the entire network and slave node statuses such as whether or not a terminal resistor is disconnected.
55	QJ71DN91	The specified slave node number is other than 0 to 63.	• Specify a slave node number between 0 and 63.
57	QJ71DN91	The sequence of the division reception is invalid.	• Check the entire network and slave node statuses such as whether or not a terminal resistor is disconnected.
257	QJ71DN91	The data length set in the buffer memory is 241 or more.	• Set the data length to 240 bytes or less.
258	QJ71DN91	An invalid value was set as a command number in the message communication command area of the buffer memory.	• Set a command number to either 0001_H, 0101_H, 0102_H, 0201_H or $FE**_H$.
300	QJ71DN91	The local node is offline.	• Turn ON Y11 to set the local node online.
301	QJ71DN91	An error occurred during data queuing.	• Execute a hardware test to verify whether or not hardware is normal.
302	QJ71DN91	A timeout occurred while waiting for a response.	• Check the entire network and slave node statuses such as whether or not a terminal resistor is disconnected.
303	QJ71DN91	An invalid response was obtained.	• Check the entire network and slave node statuses such as whether or not a terminal resistor is disconnected.
304	QJ71DN91	A node number being used for a reserved node was specified.	• Set a node number that is not being used for a reserved node.
305	QJ71DN91	A message was sent to the local node.	• Specify a node other than the local node to send messages.
306	QJ71DN91	Opening of the message connection failed.	• Check whether the parameter message group has been set correctly or not.
317	Slave node	The response data length is too long.	• Verify that the transmission message can be responded by a slave node.

9.3 Verifying the QJ71DN91 Status on the GX Developer System Monitor

When the QJ71DN91 detailed information is selected on the GX Developer system monitor, the error codes and LED illumination status can be verified.

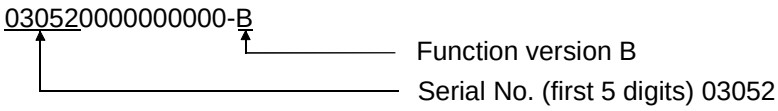
(a) Setting procedure

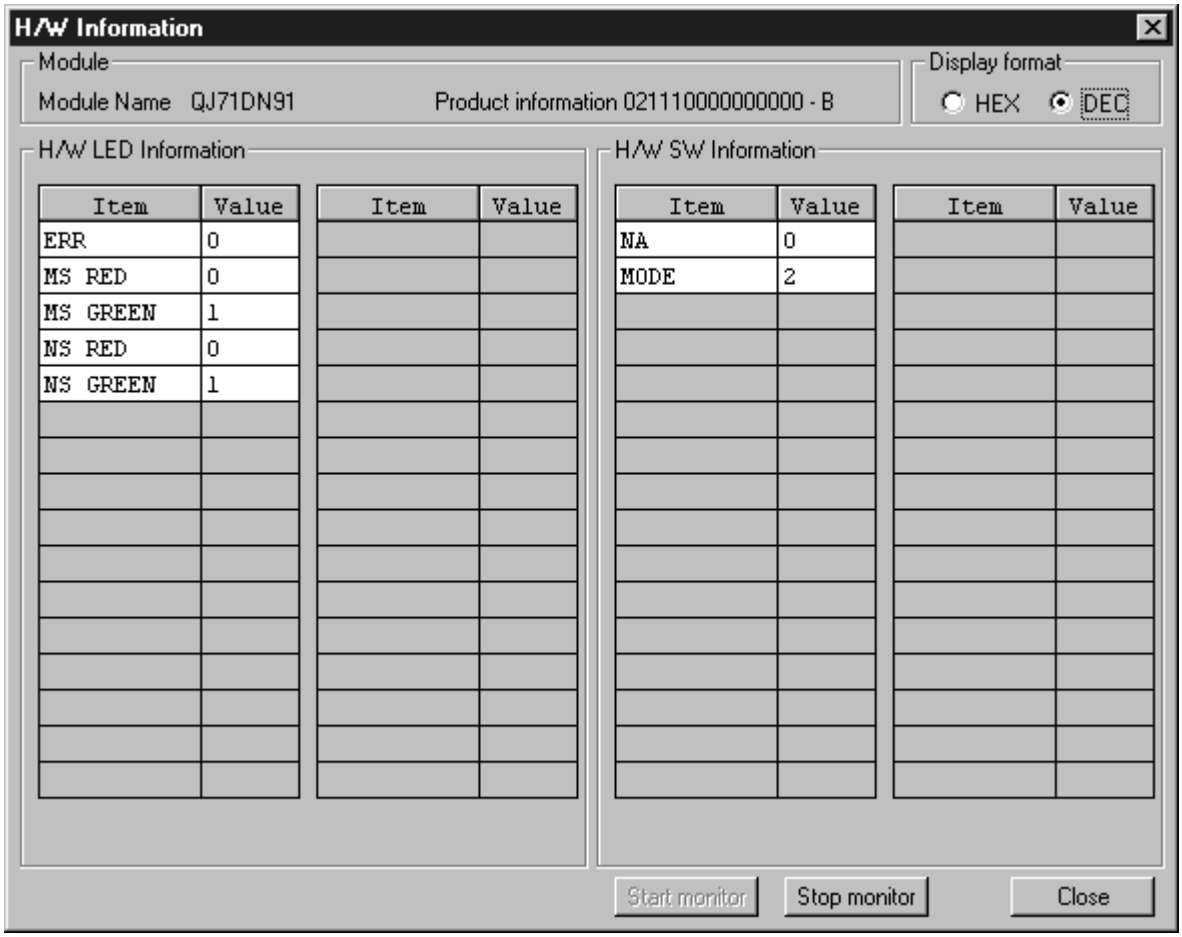
Select the module by clicking "Diagnostics" - "System Monitor," and then click "Module's is Detailed Information" - "H/W Information."



(b) Product information

Displays the function version and serial No. as shown below:





(c) H/W LED Information

Displays the LED illumination status of the QJ71DN91. (0: off, 1: on)

ERR:	Indicates the "ERR" LED on status.
MS RED:	Indicates the "MS red" LED on status.
MS GREEN:	Indicates the "MS green" LED on status.
NS RED:	Indicates the "NS red" LED on status.
NS GREEN:	Indicates the "NS green" LED on status.

(d) H/W SW Information

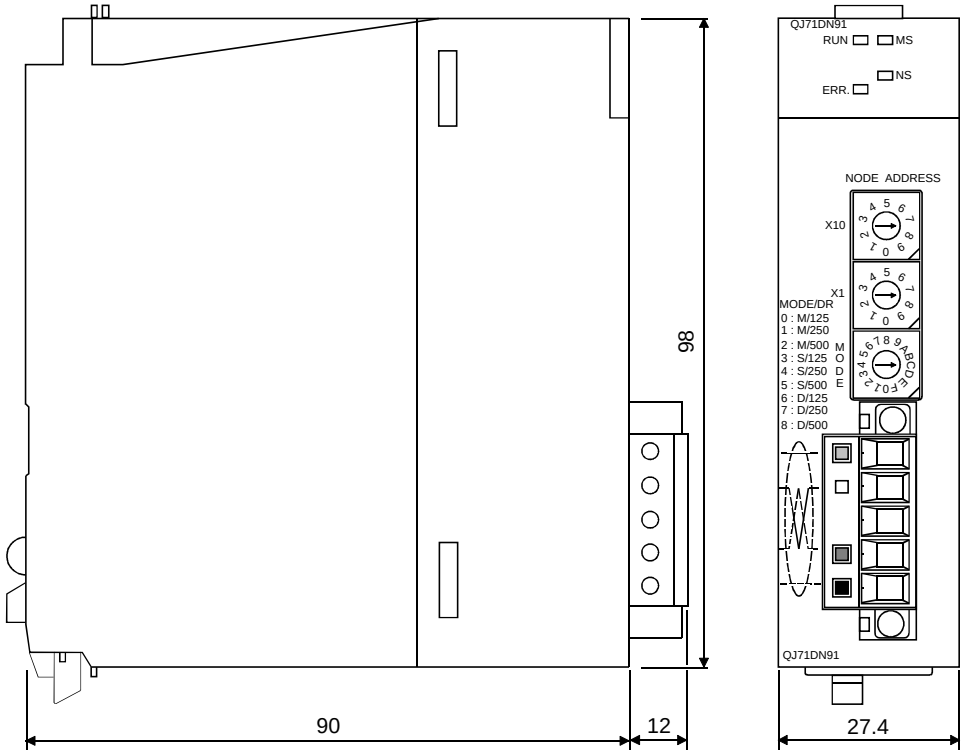
Displays the switch setting status of the QJ71DN91.

NA:	Displays the node number setting status.
MODE:	Displays the mode switch status.

APPENDIX

Appendix 1 External Dimension Diagram

The following figure shows an external dimension diagram of the QJ71DN91:



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Appendix 2 Differences between the QJ71DN91 and the AJ71DN91/A1SJ71DN91

The following table lists the differences between the QJ71DN91 and the AJ71DN91/A1SJ71DN91:

Function \ Model name	QJ71DN91	AJ71DN91/A1SJ71DN91
DeviceNet master/slave function	DeviceNet master function and DeviceNet slave function	DeviceNet master function only
Number of I/O points of the DeviceNet master function	Input 4096 points, output 4096 points	Input 2048 points, output 2048 points
Auto configuration function	Available	Not available
Auto refresh function with PLC CPU	Available (requires GX Configurator-DN)	Not available
Constant scan	Available	Not available
Hardware test/communication test function	Available	Not available
Parameter setting method	3 types • Setting with sequence programs • Setting with GX Configurator-DN • Setting with the auto configuration function	2 types • Setting with sequence programs • Setting with the configuration software

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Appendix 3 Parameter Setting Sheet (For the Master Function)

Item	Setting range	Buffer memory address	Remark	Setting value
Constant scan	0 ms to 65535 ms	01D7H	Setting to make the link scan time constant.	

Item	Setting range	Buffer memory address	Remark	Setting value
Node number and message group of the nth slave node	Higher byte: 01H to 04H or 80H	01D8H+(□-1) × 8	Node that supports 01H → UCMM and uses either message group 3, 2 or 1. Node that supports 02H → UCMM and uses message group 2. Node that supports 03H → UCMM and uses message group 1. Node that does not support 04H → UCMM (group 2 dedicated server). 80H → Reserved node	
	Lower byte: 00h to 3FH (0 to 63)		Node number of the nth slave node	
Connection type of the nth slave node	0001H, 0002H, 0004H, 0008H,	01D9H+(□-1) × 8	Connection type of I/O communication 0001H: Polling 0002H: Bit strobe 0004H: Change-of-state 0008H: Cyclic	
Byte module count of the nth slave node	Higher byte: Output byte module count Lower byte: Input byte module count	01DAH+(□-1) × 8	Both are in byte unit.	
Word module count of the nth slave node	Higher byte: Output word module count Lower byte: Input word module count	01DBH+(□-1) × 8	Both are in word unit.	
Double-word module count of the nth slave node	Higher byte: Output double-word module count Lower byte: Input double-word module count	01DCH+(□-1) × 8	Both are in double-word unit.	
Expected packet rate of the nth slave node	Communication watchdog timer value for slave node (ms)	01DDH+(□-1) × 8	Set the communication watchdog timer value for a slave node. When communication between the master node and the first slave node is interrupted for the period of time set here, the first slave node performs the operation specified in buffer memory 01DEH. Setting value = 0000H (default value) → 500 ms Setting value ≠ 0000H → Setting value -1 is the expected packet rate (ms).	
Watchdog timeout action of the nth slave node	0000H, 0001H 0002H, 0003H	01DEH+(□-1) × 8	Watchdog timeout action at a slave node Setting value = 0000H: Timeout (default value) Setting value = 0001H: Timeout Setting value = 0002H: Auto delete Setting value = 0003H: Auto reset	
Production inhibit time of the nth slave node	Minimum transmission interval of slave node (ms)	01DFH+(□-1) × 8	Minimum transmission interval of a slave node: Set the minimum time that is required for the slave node to prepare transmission data. The master node sends the polling request and bit strobe request to the slave node using this time interval. Setting value = 0000H: (default value) → 10 ms Setting value ≠ 0000H: → Setting value -1 is the minimum transmission interval (ms).	

Note: (1) "n" indicates a number between 1 and b3.
(2) Use a copy of this sheet when setting the parameter.

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Appendix 4 Parameter Setting Sheet (For the Slave Function)

Item	Setting range	Buffer memory address	Remark	Setting value
Setting area for the number of slave function input points	0 to 128 bytes	060E$_H$	Sets the I/O data reception size for the slave function parameters.	
Setting area for the number of slave function output points	0 to 128 bytes	060F$_H$	Sets the I/O data transmission size for the slave function parameters.	

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Appendix 5 List of Communication Parameters of Slave Nodes Manufactured by Various Manufacturers

The following table lists an example of parameter setting values in order to communicate with slave nodes manufactured by various manufacturers. For more details on the parameter settings, please contact each manufacturer.

Name of manufacturer	Model name	Name	Setting value (setting values in parentheses indicate when parameters are set with sequence programs)									Remark	
			Connection type	Byte module count		Word module count		Double-word module count		Expected Packet Rate	Watch-dog Timeout Action	Production Inhibit Time	UCMM	Message group
				Output	Input	Output	Input	Output	Input					
Mitsubishi Electric Corporation	QJ71DN91	DeviceNet master/slave module	Polling (H1)	00H to 80H	00H to 80H	00H	00H	00H	00H	200ms (K201)	Timeout (H1)	0ms (H0)	Yes	3
	FR-A5ND	A500 Series inverter DeviceNet option	Polling (H1)	04H	04H	00H	00H	00H	00H	1000ms (K1001)	Timeout (H1)	10ms (K11)	Yes	3
Rockwell Automation Japan Co., Ltd.	1794ADN	Flex I/O DeviceNet adapter	Polling (H1)	00H	02H	00H	00H	00H	00H	1000ms (K1001)	Timeout (H1)	10ms (K11)	Yes	3
			Bit strobe (H2)							1000ms (K1001)		10ms (K11)		
			Change-of-state (H4)							0ms (H0)		0ms (H0)		
			Cyclic (H8)							30ms (K31)		25ms (K26)		
	1794-IB16	Flex I/O input module	—	02H	02H	00H	00H	00H	00H	—	—	—	—	—
	1794-OB16	Flex I/O output module	—	02H	02H	00H	00H	00H	00H	—	—	—	—	—
Omron Corporation	DRT1-ID08	CompoBus/D 8-point input	Polling (H1)/ bit strobe (H2)	00H	01H	00H	00H	00H	00H	1000ms (K1001)	Timeout (H1)	10ms (K11)	No	—
	DRT1-ID16	CompoBus/D 16-point output	Polling (H1)/ bit strobe (H2)	00H	02H	00H	00H	00H	00H	1000ms (K1001)	Timeout (H1)	10ms (K11)	No	—
	DRT1-OD08	CompoBus/D 8-point output	Polling (H1)	01H	00H	00H	00H	00H	00H	1000ms (K1001)	Timeout (H1)	10ms (K11)	No	—
	DRT1-OD16	CompoBus/D 16-point input	Polling (H1)	02H	00H	00H	00H	00H	00H	1000ms (K1001)	Timeout (H1)	10ms (K11)	No	—
	DRT1-AD04	CompoBus/D 4-point analog input	Polling (H1)/ bit strobe (H2)	00H	00H	00H	04H	00H	00H	1000ms (K1001)	Timeout (H1)	10ms (K11)	No	—
	DRT1-DA02	CompoBus/D 2-point analog output	Polling (H1)	00H	00H	02H	00H	00H	00H	1000ms (K1001)	Timeout (H1)	10ms (K11)	No	—
IDEC (Izumi) Corporation	SX5D-SBN16S	DeviceNet 16-point digital input	Polling (H1)	00H	02H	00H	00H	00H	00H	1000ms (K1001)	Timeout (H1)	10ms (K11)	No	—
	SX5D-SBT16K	DeviceNet 16-point digital output	Polling (H1)	02H	00H	00H	00H	00H	00H	1000ms (K1001)	Timeout (H1)	10ms (K11)	No	—
	SX5D-SBM16K	DeviceNet 8-point digital input/8-point digital output	Polling (H1)	01H	01H	00H	00H	00H	00H	1000ms (K1001)	Timeout (H1)	10ms (K11)	No	—

Appendix 6 EDS File of the QJ71DN91

The following shows the EDS file of the QJ71DN91. The EDS file is stored in the CD-ROM of GX Configurator-DN.

```
$ Mitsubishi Master/Slave EDS file

$ File Description Section
[File]
   DescText="QJ71DN91 EDS file";
   CreateDate=08-28-2000;                    $ created
   CreateTime=12:00:00;
   ModDate=08-28-2000;                       $ last change
   ModTime=12:00:00;
   Revision=1.1;                             $ Revision of EDS

$ Device Description Section
[Device]
   VendCode=0xA1;
   VendName="MITSUBISHI ELECTRIC CORPORATION";
   ProdType=0x0C;                            $ Communication Adapter Device
   ProdTypeStr="Communication Adapter";      $ Communication Adapter Device
   ProdCode=4;
   MajRev=1;
   MinRev=1;
   ProdName="QJ71DN91";
   Catalog="";

$ I/O Characteristics Section
[IO_Info]
   Default=0x0001;                           $ Poll Only
   PollInfo=0x0001,
      1,                                     $ Default Input = Input1
      1;                                     $ Default Output = Output1

  $ Input Connections
   Input1=                                   $Input(Producing)
      8,                                     $ 8 byte
      0,                                     $ 0 bits are significant
      0x0001,                                $ Poll Only Connection
      "Input Data",                          $ Name
      6,                                     $ Path Size
      "20 04 24 64 30 03",                   $ Assembly Object Instance 100
      "Data";                                $ Help
  $ Output Connections
   Output1=                                  $Output(Consuming)
      8,                                     $ 8 byte
      0,                                     $ 0 bits are significant
      0x0001,                                $ Poll Only Connection
      "Output Data",                          $ Name
      6,                                     $ Path Size
      "20 04 24 65 30 03",                   $ Assembly Object Instance 101
      "Data";                                $ Help

[ParamClass]
   MaxInst=0;
   Descriptor=0x00;
   CfgAssembly=0;
```

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WARRANTY

Please confirm the following product warranty details before starting use.

1. Gratis Warranty Term and Gratis Warranty Range

If any faults or defects (hereinafter "Failure") found to be the responsibility of Mitsubishi occurs during use of the product within the gratis warranty term, the product shall be repaired at no cost via the dealer or Mitsubishi Service Company. Note that if repairs are required at a site overseas, on a detached island or remote place, expenses to dispatch an engineer shall be charged for.

[Gratis Warranty Term]

The gratis warranty term of the product shall be for one year after the date of purchase or delivery to a designated place.

Note that after manufacture and shipment from Mitsubishi, the maximum distribution period shall be six (6) months, and the longest gratis warranty term after manufacturing shall be eighteen (18) months. The gratis warranty term of repair parts shall not exceed the gratis warranty term before repairs.

[Gratis Warranty Range]

(1) The range shall be limited to normal use within the usage state, usage methods and usage environment, etc., which follow the conditions and precautions, etc., given in the instruction manual, user's manual and caution labels on the product.

(2) Even within the gratis warranty term, repairs shall be charged for in the following cases.

1. Failure occurring from inappropriate storage or handling, carelessness or negligence by the user. Failure caused by the user's hardware or software design.
2. Failure caused by unapproved modifications, etc., to the product by the user.
3. When the Mitsubishi product is assembled into a user's device, Failure that could have been avoided if functions or structures, judged as necessary in the legal safety measures the user's device is subject to or as necessary by industry standards, had been provided.
4. Failure that could have been avoided if consumable parts (battery, backlight, fuse, etc.) designated in the instruction manual had been correctly serviced or replaced.
5. Failure caused by external irresistible forces such as fires or abnormal voltages, and Failure caused by force majeure such as earthquakes, lightning, wind and water damage.
6. Failure caused by reasons unpredictable by scientific technology standards at time of shipment from Mitsubishi.
7. Any other failure found not to be the responsibility of Mitsubishi or the user.

2. Onerous repair term after discontinuation of production

(1) Mitsubishi shall accept onerous product repairs for seven (7) years after production of the product is discontinued. Discontinuation of production shall be notified with Mitsubishi Technical Bulletins, etc.

(2) Product supply (including repair parts) is not possible after production is discontinued.

3. Overseas service

Overseas, repairs shall be accepted by Mitsubishi's local overseas FA Center. Note that the repair conditions at each FA Center may differ.

4. Exclusion of chance loss and secondary loss from warranty liability

Regardless of the gratis warranty term, Mitsubishi shall not be liable for compensation to damages caused by any cause found not to be the responsibility of Mitsubishi, chance losses, lost profits incurred to the user by Failures of Mitsubishi products, damages and secondary damages caused from special reasons regardless of Mitsubishi's expectations, compensation for accidents, and compensation for damages to products other than Mitsubishi products and other duties.

5. Changes in product specifications

The specifications given in the catalogs, manuals or technical documents are subject to change without prior notice.

6. Product application

(1) In using the Mitsubishi MELSEC programmable logic controller, the usage conditions shall be that the application will not lead to a major accident even if any problem or fault should occur in the programmable logic controller device, and that backup and fail-safe functions are systematically provided outside of the device for any problem or fault.

(2) The Mitsubishi general-purpose programmable logic controller has been designed and manufactured for applications in general industries, etc. Thus, applications in which the public could be affected such as in nuclear power plants and other power plants operated by respective power companies, and applications in which a special quality assurance system is required, such as for Railway companies or National Defense purposes shall be excluded from the programmable logic controller applications.

Note that even with these applications, if the user approves that the application is to be limited and a special quality is not required, application shall be possible.

When considering use in aircraft, medical applications, railways, incineration and fuel devices, manned transport devices, equipment for recreation and amusement, and safety devices, in which human life or assets could be greatly affected and for which a particularly high reliability is required in terms of safety and control system, please consult with Mitsubishi and discuss the required specifications.

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